THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. FEBRUARY 22, 1900. CHICAGO, ILL. NUMBER 8

GENERAL LIBRARY, UNIV. OF MICH. FEB 23 1900

The only reasons that higher prices are being constantly paid by the most prominent steam users in the United States for Cahall Boilers are—that they are better made, last longer, cost less for maintenance, show a higher efficiency and make drier steam than any other kind.

Send for illustrated catalogue.

Cahall Sales Department, Pittsburg, Pa.

ROOFING
(IRON OR STEEL)

is to a building what clothing is to the body—it must protect and it must wear well. To put money in an interior and to save it on the roof is poor economy.

"Piqua Roofings" possess all the requirements of first-class roof coverings. They are water-proof, durable, inexpensive, easily applied; in fact, perfect.

Address for printed matter and prices,

The Cincinnati Corrugating Co.,
Box 702 PIQUA, OHIO.

HONEST BABBITT METALS.

We do not claim that we are supplying ten different governments with Babbitt Metal. **Our Metals** are used by more than three thousand leading Consumers in UNCLE SAM'S own country. They are invariably uniform, reliable, contain only pure and best material, remarkably fluid, and free from "drossing."

PRICES TO ALL.—XXX Nickel Babbitt 24 cts. per lb.; No. 2 Grade (for general shop use), 10 cts. per lb.; F. O. B. your depot, on your customary terms. Any special mixture of metal made to order. 3,000 References.

SWARTS METAL REFINING CO., Office and Works, 20 N. Desplaines St., **Chicago, Ill.**

ENTERPRISE BOILER COMPANY Draught Stacks, Blast Furnaces and Heavy Plate Work a Specialty.
YOUNGSTOWN, O. Write for Estimates.

POWER TRANSMISSION
W. A. JONES FOUNDRY & MACHINE CO.
53-59 So. JEFFERSON ST. CHICAGO

THE UNION BOILER TUBE CLEANER CO.
231 Penn Ave., PITTSBURGH, PA.

Has set the acknowledged standard for the world for removing—by power driven mechanical devices—all conditions of scale from all makes of Water Tube Boilers including the Climax and Stirling types, the Hazelton boiler, and also from pipes and tubes used in industrial enterprises. We have the only **Flexible Shaft of Remarkable Strength and Phenomenal Durability under Great Stress.**

..Fire Brick..
Ground Clay A SPECIALTY.

WEBSTER FIRE BRICK CO.
SOUTH WEBSTER, SCIOTO CO., OHIO.
BLAST FURNACE, ROLLING MILL, MALLEABLE IRON AND LIME KILN BRICK.
BEST ON EARTH

Special Shapes.

Blakeslee Steam Jet Pump.
REASONS FOR ITS USE:
1. Simplicity. 2. Is independent of engine. 3. Will pump sandy or impure water. 4. Have no valves and no wear. 5. Not subject to freezing. 6. Economy and reliability. 7. All parts interchangeable. Write
BLAKESLEE MFG. CO., Du Quoin, Ill.

TURNBUCKLES.

Cleveland City Forge & Iron Co.,
CLEVELAND, O.

W. S. ROCKWELL & CO.,
OIL FURNACES.
26 Cortlandt St., New York City.

PIG IRON & COKE.
J. H. HILLMAN & SON,
8 Wood St., PITTSBURG, PA.

Chicago Drop Forge & Foundry Co.
Works established 1880.
DROP FORGINGS
of All Kinds.
KENSINGTON, ILL.
38 minutes South of Chicago by Ills. Central R. R. Suburban trains.

PIG IRON & COKE.
ROGERS, BROWN & CO.,
See adv't on page 23. Cincinnati, O.

REPUBLIC IRON & STEEL CO., Chicago.
Manufacturers
Bar Iron, Common, Refined & B. B. Screw Iron.
DISTRICT SALES OFFICES:
Buffalo, N. Y. New York City.
Cleveland, O St. Louis, Mo.
Cincinnati, O. Birmingham, Ala.
See our advertisement on page 38.

THE ARMSTRONG PLANER TOOL.
A practical extension of the ARMSTRONG IDEA. Works right or left hand at any angles (5 sizes).
Close Corners a Specialty.
Write for latest Catalogue.

Armstrong Bros Tool Co.
Chicago, Ill., U. S. A.

Apollo galvanized iron

quickens the work, saves

time, makes money.

Apollo Iron and Steel Company, Pittsburgh.

The Bourne-Fuller Co.,
DISTRIBUTORS OF
APOLLO PRODUCTS.
Cleveland, O.

BRISTOL'S RECORDING INSTRUMENTS
For Pressure, Temperature and Electricity.
All ranges, Low Prices and fully guaranteed.
Send for Circulars and Specimen Charts.
The Bristol Co., Waterbury, Conn.

WORKS, SHARON. MINES, CLEARFIELD CO., PA.

James V. Rose,
.....PROPRIETOR.....
SHARON FIRE BRICK WORKS,
Contractor in Fire Brick Construction.
Manufacturer of High Grade Fire Brick.
ANALYSIS:

Brick.		*Red Clay.*	
Silica	54.50	Silica	47.00
Alumina	44.20	Alumina	39.00
Loss on Ign.	.05	Loss on Ign.	13.30
Iron	.15	Iron	.13

SHARON, PA.

It pays to advertise in
THE IRON TRADE REVIEW

CLOVER LEAF BRAND GALVANIZED SHEETS. STRUTHERS IRON & STEEL CO., Struthers, Ohio.
See Page 34.

THE UPSON NUT CO., Cleveland, O.
MANUFACTURERS OF
MACHINE AND CARRIAGE BOLTS, HOT FORGED AND COLD PUNCHED NUTS, LAG SCREWS, BOLT ENDS, WASHERS, ETC. Catalogue and Prices on Application.

CONNELLSVILLE COKE CO.
Producers of CONNELLSVILLE COKE ONLY
For Blast Furnace and Foundry Cupola Work; also Crushed Connellsville Coke (substitute for Anthracite Coal) for manufacturing and domestic purposes. 13,500 Ovens. Daily capacity, 30,000 tons of Coke. Direct connections with all railroads entering the region.
Quotations, Freight Rates, Pamphlets giving full information, promptly furnished on application.
Post Office: PITTSBURG, PA.
Mines and Ovens in the Connellsville Coke Region, Pa.

FRICK COKE

Riveted Steel Pipe, Stand Pipes, Receivers.

The WM. B. POLLOCK CO.

with inquiry please give ad. No. 6. YOUNGSTOWN, O.

Blast Furnaces, Steel Plant Boilers, Tanks, et

ERWIN
STEAM
RAMS
furnish an abundant constant water supply. They are simple, reliable and economical, and can be used wherever water is found, to pump from springs, lakes, wells streams, or cisterns.
SPECIAL CATALOGUE FREE ON REQUEST.
JAMES B. CLOW & SONS, CHICAGO.

MALLEABLE CASTINGS.
High Tensile Strength.

BIKE STEEL CASTINGS,
Will Not Harden in Brazing.

CARBONIZED BIKE STEEL CASTINGS,
Will Temper Like Tool Steel.

ACME MALLEABLE IRON WORKS, Buffalo, N. Y.

REED F. BLAIR & CO.
LEWIS BUILDING, PITTSBURG, PA.
Ores, Coke, Pig Iron, Ingot Moulds
Ferro-Manganese, Etc.
Brier Hill Portland Cement.
CRUSHED LIMESTONE.

Advertise in the IRON TRADE REVIEW.

AULTMAN

Chains and Chain Belt Appliances for all purposes common to such machinery, at prices that will take your business.
Write us, giving requirements. Catalogue "C" on application.
THE AULTMAN COMPANY,
908 South Market St., Canton, Ohio, U. S. A.

NONPAREIL ANTI-FRICTION METAL
Best Anti-Friction Metal for all machinery bearings. For high speed and heavy crushing weight it has no equal.
THEO. HIERTZ & SON, Sole Manufacturers, 30th St. and Park Ave., St. Louis, Mo.
Manufacturers all grades Babbitt Metals, Solder, Bar Tin, Bar Lead, Lead Car Seals, Pig Tin, Pig Lead, Antimony, Copper, Spelter, etc.

Subscribe for the Iron Trade Review. $3.00 per year.

12 Standard Types AIR COMPRESSORS with a large number of Special Patterns,
Covering the requirements of every application of compressed air. Each machine equipped with the most improved accessories relating to the economical production of compressed air. Send for new catalogue.
Rock Drills, Stone Channelers. | THE Ingersoll-Sergeant Drill CO., Cleveland, New York. | Coal Cutters, The Pohle Air Lift Pumps.

A B C OF IRON, 1.00
Iron Trade Review
Cleveland, Ohio.

The Bourne-Fuller Co.,
IRON, STEEL AND PIG IRON.
Cleveland. - Ohio.

To Mill Owners, Contractors and All Users of Machinery:
We are prepared to furnish at closest prices, all lines of first class equipment required in factories, mills, electric and power plants, etc. Send plans of specifications for quotations, giving date of delivery required.
Will accept agencies from manufacturers for sale of first class machinery in foreign countries.
American Machinery & Trading Co.,
Head Office: Bowling Green Bldg., NEW YORK.
BRANCHES: Chicago, Boston, Pittsburg, Philadelphia, Atlanta, St. Louis, San Francisco, Montreal, London. Paris. Berlin. St. Petersburg, Sydney.

RAND DRILLS AND COMPRESSORS
DRILL MOUNTINGS.
All Sizes.
Standard Types.
Special Patterns.
Highest Degree of Perfection.
Long Experience.
Recognized Leaders.
RAND DRILL CO.
100 Broadway, NEW YORK.
Monadnock Block, CHICAGO.

AIR COMPRESSORS
For every application of Compressed Air Power.
Complete Catalogue upon application.
Clayton Air Compressor Wks.
26 Cortlandt St., NEW YORK.

O. TEXTOR,
Chemist, Metallurgist and Assayer.
Analyses made of Metals, Ores, Fuels and Supplies for Furnaces, Steel Works and Foundries.
Ores sampled at mines, furnaces and lake ports.
Advice furnished to operators of Blast Furnaces Steel Works and Foundries.
Mining properties reported upon.
158 Superior St. CLEVELAND, O.

Cable Address "METALFAC-CHICAGO" ABC Code
E. H. STROUD & CO.,
METAL FACTORS.
The Products of and Supplies for
IRON · STEEL · TIN-PLATE · BRASS
COPPER · LEAD · & · ZINC · WORKS.
36 La Salle Street *100 William Street*
CHICAGO. NEW YORK.

THE ROBERT W. HUNT & CO.
Bureau of Inspection, Tests and Consultation.
PITTSBURG: Park Building. CHICAGO: 1201 The Rookery. NEW YORK: 71 Broadway.
Reports on iron and steel processes and plants. Inspection of steel rails, splice bars, railroad cars, wheels, axles, etc. Chemical Laboratory—Analysis of ores, iron, steel, oils, water, etc. Physical Laboratory—Test of metals, drop and pulling test of couplers, draw bars, etc. Efficiency tests of boilers, engines and locomotives.

F. A. EMMERTON.
Analytical Chemist,
AND METALLURGIST.
Ores sampled at lake ports, mines and furnaces.
Mines and Metallurgical Processes examined.
Analyses made of Ores, Metals, Fuels, Railroad and Foundry Supplies, etc.
9 Bratenahl Building, CLEVELAND, O.

John T. Jones & Co.,
Mines, Prospects, Explorations and Mineral Lands, examined, experted, practical tests made and reported. Reliable and practical sampling done. Chemical analysis made. All work done by practical expert. Best of reference as to experience and reliability. Address
Suite 32, 115 Monroe St.,
MONTAUK BLOCK, CHICAGO, ILLS.

Yards, Chicago Heights.
Iron and Steel Scrap
FOR SALE, Prompt Shipment:
1,000 tons No. 1 cast scrap; 1,000 tons Steel Rails, 4 ft. and over; 1,000 tons No. 1 railroad wrought scrap; 300 tons iron axle turnings; 1,500 tons iron rails; 200 tons iron axles.
In the Market to buy:
1,000 Tons Mixed Lengths STEEL RAILS.
In answering mention paper.

A B C OF IRON,
NOW $1.00.

Subscribe for THE IRON TRADE REVIEW

THE IRON TRADE REVIEW

VOLUME XXXIII. CLEVELAND, O. FEBRUARY 22, 1900. CHICAGO, ILL. NUMBER 8

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

That consumption of iron and steel has been not only sustained but has grown under the high prices at which most of the material now being shipped was bought, in the second half of 1899, is the substantial factor in the present waiting situation. The past week has not brought any positive indication of the breaking of the present deadlock, but in view of the strong sentiment favorable to a lower level, and the active effort of buyers to bring it about, it is proof of marvelous strength that these influences should have been resisted as they have been. The argument from the selling side is that each week that passes without material change only increases the tonnage that must be taken within a short space of time when it is at last let loose. It must be said that the approach of the active season of the year is calculated to tighten rather than relax any tendency toward easier conditions that may have appeared in the past fortnight. A few buyers have reasoned that the concessions offered in pig iron and in certain finished lines this month were worth getting and were more certain than the possibility of larger ones for which the average buyer has waited. Another month is likely to show which view is correct. As noted one week ago, the foreign situation, which shows increasing firmness, is an important element in the problem. Advances have been made in some lines, in British markets, and the chief uncertainty is the possibility of material from the United States being offered in quantities sufficient to disturb the equilibrium. From the present outlook, the available surplus from this country in 1900 should not be an occasion of anxiety abroad. The one phase of this matter that is of moment is whether American manufacturers will need to provide a temporary outlet for a fractional part of their product, to save the home market from the demoralization that comes when the descent from a high level fairly begins. Bessemer iron is firm and some sales have been made with deliveries in second and third quarters, at $24 valley furnace. Large deals for the third quarter still wait, though inquiries are before the Bessemer furnacemen. When the business is done the indications are that it will be on the $24 basis. The steel situation is unchanged except that in the East considerable business has been finally placed at about $36. A corresponding reduction in the Pittsburg price does not come, and while rumors of lower prices than $35, Pittsburg and valley, are heard, large contracts still wait. Foundry iron buying is relatively scant. The current business is done at concessions ranging from 25 cents in the West to 75 cents in the East, from the quotations at the opening of the year; but this is not the sort of scaling down for which the mass of buyers are waiting. Finishing mills, with occasional exceptions, are fully employed. The conolidationss have met any slackening by concentrating operations, but little of this has been necessary. A continuing feature in finished material is the heavy tonnage on the books of structural mills; in angles particularly the congestion is already a problem. Whether the plate market has touched bottom is yet in doubt. Some mills have refused business below 2.20c for tank, Pittsburg, in view of the heavy tonnage in sight for the coming season, but 2.15c has been done. Sheet mills maintain the new minimum of 3.05c Pittsburg for No. 27 and within another month it is expected the consolidation will be effective.

PITTSBURG.

OFFICE OF *The Iron Trade Review*.
1125-1126 PARK BUILDING, Feb. 21.

Sales of Bessemer iron aggregating 20,000 tons were made during the past week, at the association's quotation. The greater portion of this iron is for Eastern shipment, while 5,000 tons is for delivery in Pittsburg. Negotiations are still pending for several sales in large blocks for delivery in the third quarter. The sales above mentioned are for delivery between April and September. Gray forge iron has been fluctuating during the past week, owing to the sales of several small lots in this district by producers farther East at $20.50. It is said to be not as desirable for certain uses, however, as the product held in this district at $21, and furnacemen claim to have no trouble whatever in securing this figure. While the association is still maintaining $21.50 at valley, it is not receiving this price, and sales are reported at $21 and $21 25, valley. One of the producers of track material no longer seeks business in the general trade, which may in the future have a tendency to stiffen the market. Steel plates continue easy, with 2.20c rather than 2.25c the prevailing quotation on assorted widths. Sheets continue firm at 3.10c the minimum for No. 28 for delivery within the next 30 days. Mills refuse to give quotations for delivery after April 1. Coke is firm at the high figures recently quoted with no indications of relief from the present strain until the middle of the year.

PIG IRON.—Sales of No. 2 foundry iron aggregating 2,500 tons at $23 and $23 25 have been reported. Small lots of No. 1 foundry have been sold at $24. The foundrymen are showing little disposition to purchase for future delivery and as the furnaces are not urging sales the prevailing prices are being easily maintained. Some Northern forge is being offered in this market, but consumers refuse to pay more than $21, although sales at $21.25 valley have been reported. Southern forge is practically out of the market, although there is some inquiry for it. We quote as follows:

Bessemer, valley furnace	$24.00
Bessemer, Pittsburg	24 90
No. 1 Foundry	23.75 to 24.00
No. 2 Foundry	23.00 to 23.25
No. 3 Foundry	22.25 to 22.50
Gray Forge, valley furnace	21.00 to 21.25
Gray Forge, Pittsburg	21.00

STEEL.—Numerous small sales of steel have been made during the past week but no large contracts are reported. Consumers still hold off for a sign of a weaker market but up to date there is no indication of a bearish movement. We quote $35 for 4x4 billets and $36 for small billets, at mill, Pittsburg, Wheeling or valley. Sheet bars are quoted at $36, mill. The sheet mills have not generally come into the market and will not until it is definitely known, whether the consolidation, which is well under way, will be consummated. Two Ohio plants asked quotations last week.

FERRO-MANGANESE.—We continue the quotation of $125 for domestic 80 per cent.

RAILS AND TRACK MATERIAL.—Jones & Laughlins, who are

among the principal producers of track materials, are no longer offering their product, with the exception of spikes, to the trade. The nuts and bolts they manufacture are largely being used in the erection of the additions to their present plant. There is very little demand here for links and pins and owing to the almost general use of the patent couplers, it will only be a short time before the big trunk lines have no further demand for them. An order for about 6,000 tons of steel rails at prevailing quotations was placed here last week for shipment to British North Borneo. Our quotations follow unchanged: Rails, standard sections, over 200 tons, $35; 100 to 200 tons, $37; car lots, $38; less than car lots, $40; light rails, 25-poundand less than 50-pound, $37, all f. o. b. mill, Pittsburg; track material—spikes, 2.50c; track bolts square nuts, 3.60c; hexagon nuts, 3.60c to 3.85c; splice bars, 2.50c to 2.60c; links and pins, 3c to 3.10c.

SPELTER.—The market is easier than last week and prime Western grades are held at 4.65c to 4.70c, Pittsburg.

SKELP.—There is moderate demand for skelp and small sales have been made during the past week at prevailing quotations: Grooved iron, 2.15c; grooved steel, 2.15c to 2.20c; sheared iron, 2.25c, and sheared steel, 2.25c to 2.30c.

MUCK BARS.—While the sale of 500 tons of muck bars at $32 during the past week has been reported it is said not to represent the market price. This sale was of an odd lot for which the mill wanted early shipment. We quote $33.25 to $33.50 as the basis for standard quality, although $34 is being asked in several instances. Lower quotations are made for scrap muck.

BARS.—The base price of steel bars, 2.25c in large lots, is being well maintained in this market although it is reported that Eastern manufacturers are shading the price. On small lots 2.35c is asked. Refined iron bars are quoted at 2.40c, Pittsburg, and common iron bars at 2.15c, valley. The market is steady with many sales in small lots.

STRUCTURAL MATERIAL.—The erection of the bridge across the Monongahela river by the Carnegie Steel Co., through its Keystone plant, for the purpose of connecting the Carrie Furnaces with the Homestead Steel Works, will take a large tonnage of structural material out of this market. An order for several thousand tons for bridges to be used in the erection of a road to be built in British North Borneo, was also placed with the Keystone Bridge Co. Outside of this the market situation has been quiet though with good inquiries. We quote as follows: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees, 2.30c; zees, 2.25c; angles, 2.25c. Universal mill plates, 2.30c to 2 45c, according to delivery and size of order.

PIPES AND TUBES.—The new schedule of prices which the leading producer has already arranged will be given to the trade on March 1. The demand continues good for this time of the year, but no large contracts have been closed in the week. We continue to quote: Merchant pipe, 50 and two 10's for car-loads delivered within the specified territory; well casing, screw and socket joint, 37½; inserted joint, 32½, with an optional 5 per cent to dealers only; boiler tubes 1¼-inch to1½-inch, 40 per cent off; 1¾-inch to 2½-inch, 50 per cent off for iron and 55 per cent off for steel; 2¾-inch and larger, 52½ per cent off for iron and 55 per cent off for steel, with 5per cent additional in carloads, less than carloads being f. o.b. mill.

PLATES.—The market continues easy and 2.20c rather than 2.25c is generally being quoted on tank plates, assorted widths. On large orders 2.15c is being done. The demand is reported good. We quote shell steel at 2.40c to 2.50c; flange, 2 50c to 2.60c; fire box, 3c to 3½c.

SHEETS.—Sheets continue very firm and mills will only give quotations for delivery after April 1, owing to the impending consolidation of the sheet mills. It is now reported that most of the four plants upon which options were not secured may be included when the consolidation is finally consummated. The minimum that is being quoted for sheets, 28 gauge, is 3.10c, while 3.15c is being paid in some instances. Iron sheets are .05c less. Galvanized sheets continue to advance and the mills are all quoting on large lots 75, with the usual 15 cent freight allowance. Sales in small lots have been made at 70 and 10, and 70 and 10 and 5.

OLD MATERIAL.—The market continues very dull, with a rather wide range of prices on new melting stock. Our quotations follow: New basic melting stock, $27 to $30; new Bessemer melting stock, $23 to $25; basic open-hearth scrap, $25 to $28; steel rails, mixed lengths, $23 to $25; short lengths, $23.75 to $25.75; iron rails, $25 to $26; cast borings, $13 to $14 gross tons; cast scrap, $18; No. 1 wrought scrap, $24 to $25, net tons; busheling scrap, $16 to $18, net tons.

COKE.—Despite the sudden cold snap, the railroads furnished the coke companies with an abundance of cars during the past few days, and the situation, which is much strained, was not made worse. The product continues very scarce, however, and the prevailing price for foundry coke is $3.50 to $4 and in small lots, and as much as $4.25 has been paid. Furnace coke is being held at $3.25 to 3.50. The H. C. Frick Coke Co. will fire 125 additional ovens, about April 1, which will give some relief.

CHICAGO.

Office of The Iron Trade Review,
1522 MONADNOCK BLOCK, Feb. 21.

The situation has changed very little in the week. The most important development is the announcement of the formation of the sheet mill consolidation, which has had the effect of advancing the sheet market materially. Business generally has not been especially active, although fair sales in most lines have been made.

PIG IRON.—Demand has been quiet, and in most case limited to small lots. Two or three good sized orders were taken, and the aggregate of small orders was very satisfactory. Foundries are all running full, and are taking iron as fast as furnaces can make shipments, and some complaint is heard because furnaces are behind in shipments. The shortage of coke continues and is causing considerable trouble. The leading producers are firm and are making no concessions, but some of the smaller furances are quoting 25 cents under the market as given below. This is only true of some of the Southern furnaces, however, as Northern furnaces are very firm and are not selling except at full prices. Quotations are unchanged as follows:

Lake Sup. Charcoal	$25 50 @ $26 50	Southern Coke No. 3	$20 85 @ $21 85
Local Coke Fdy. No. 1	25 00 @ 25 50	Southern No. 1 Soft	22 85 @ 23 35
Local Coke Fdy. No. 2	24 00 @ 25 00	Southern No. 2 Soft	21 85 @ 22 35
Local Coke Fdy. No. 3	23 00 @ 24 00	Southern Silveries	26 50 @ 27 00
Local Scotch Fdy. No.1	25 00 @ 25 50	Jackson Co. Silveries	31 50 @ 32 50
Local Scotch Fdy. No.2	24 00 @ 25 00	Ohio Strong Softeners	24 00 @ 25 00
Local Scotch Fdy. No.3	23 00 @ 24 00	Alabama Car Wheel	25 00 @ 26 00
Southern Coke No. 1	22 85 @ 23 85	Malleable Bessemer	25 00 @ 26 00
Southern Coke No. 2	21 85 @ 22 85	Coke Bessemer	25 00 @ 26 00

BARS.—Sales were larger last week than in the week before and included several round lots. The demand seems to be increasing all the time and the number of inquiries in the market is quite a little larger than a week ago. Quotations are unchanged and firm at 2.30c for iron and 2.35c for steel, half extras, Chicago delivery.

CAR ORDERS.—Two or three good orders for cars were given out in the week, and there are more to follow. The demand for car material is better and several good sales have been made, including one for several hundred tons of axles.

RAILS AND TRACK SUPPLIES.—The market is quiet and unchanged. Sales have not been large and the demand is not heavy. Quotations follow: Rails, standard sections, $35 to $38; light sections, $37 to $42; splice bars, 2.50c to 2.70c; spikes, 2.65c to 2.75c; track bolts, 3.85c to 3.95c.

BILLETS AND RODS.—The market is quiet with only a few small lots sold last week. There is no very large demand for immediate delivery. Bessemer billets are quoted at $35 and sheet bars at $36, Pittsburg, with $2 added for Chicago delivery. Open-hearth rods are quoted at $65 and Bessemer at $55, by Central Western mills.

PLATES.—Several good orders for delivery from store were received, but mill business was limited to small lots. The demand is fair, and two or three quite large inquiries are in the market. The market is unchanged and prices are about as follows, although lower quotations have been made: We quote tank steel from store 2.75c to 2.85c. Mill shipments, Chicago delivery: Tank steel 2.40c to 2.50c; shell, 2.45c to 2.55c; flange, 2.55c to 2.60c; marine, 2.65c to 2.75c; fire box, 2.85c and up, according to brand.

STRUCTURAL MATERIAL.—The labor situation in the building trades is more serious than ever, and the trouble seems far from solution at present. Business consequently has been light, and only a few contracts have been placed in the week. Railroad orders continue good, and one large contract, for 5,600 tons of bridge material from the C. & N. W. road, was

placed, together with several smaller orders. Quotations follow: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches and over six inches, 2.50c; three inches to six inches, 2.40c; sheared plates 2.50c to 2.60c; universal plates, 2.50c to 2.65c; tees, 2.45c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

SHEETS.—Immediately the announcement of formation of the sheet mill combine prices advanced sharply, quotations now being about $3 a ton higher than a week ago. The demand has also increased, and several good contracts were placed in the week. Quotations are now made at 3.20c to 3.30c for No. 27 black, and 75 per cent off for galvanized, on mill shipments.

MERCHANT STEEL.—The demand was somewhat better and several quite good orders were placed, both for mill and store shipment. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel; 3.65c to 3.75c; tool steel, 7c to 7.50c; special, 13.50c and upwards.

MERCHANT PIPE.—The market is very firm and higher prices are looked for in the near future. Demand has increased, several good sales having been made in the week. Quotations are unchanged at 50, 10 and 5 off for small orders, and 50, 10 and 10 off for large orders, mill shipment.

WIRE AND WIRE NAILS.—The sales of the week were large and buying seems to be increasing every week. The demand is heavier for both large and small lots and buyers are making very frequent purchases. Quotations are firm and unchanged. Makers quote single carloads of wire nails at $3.53, f. o. b. Chicago, and $3.63 for less than carloads. On wire, current quotations are as follows: Plain annealed wire, $3.38; painted barb wire, $3.98; galvanized barb wire, $4.13.

OLD MATERIAL.—Sales have been somewhat better and the demand indicates heavy consumption by users of scrap. Stocks have decreased to some extent, and it is not always possible to secure large amounts on short notice. Dealers' selling prices are about as given below:

Old iron rails, gross,	$24 00@$25 00	Country malleable	$14 00
Old steel rails, long, gr.	22 00	Iron axles, net	$27 00@28 00
Old steel rails, mixed	19 00@19 50	Cast borings, net	9 00@10 00
Relaying rails, gross	28 00@30 00	Wrought turnings, net	11 00@12 00
Old wheels, gross	24 00@24 50	Iron axle turnings, net	14 00@15 00
Railroad forge, net	24 00	Steel axle turnings	12 00@12 50
Dealer's forge, net	16 50@17 00	Mixed country steel, gr	13 50
No. 1 cut mill, net	14 00	Stove plates, net	10 00@10 50
Heavy cast, net	14 50@15 00	Heavy melting steel, gr	18 00@19 00
Railway malleable, net	15 00	Old iron splice b., net	26 00

Stevenson, Field & Co., of Columbus, O., announce that they have opened an office at 700-702 Fisher Building, Chicago, with Irvin McDowell, who is well known to the Western foundry trade, in charge as local manager.

CLEVELAND.

OFFICE OF *The Iron Trade Review*, 27 VINCENT ST., Feb. 21.

The ore trade has not yet come into a season of renewed buying, but the next considerable movement in pig iron is expected to bring it. Shipments from docks to furnaces are heavy, perhaps heavier than usual at this season. At the same time production is going on at an exceptional rate at the underground properties on Lake Superior, and every effort will be made, in view of the high freights, to get an early start in shipping. In spite of the enormous tonnage taken by ore shippers, there is said to be some further inquiry for boats, particularly for the head of Lake Superior. The lapse of three months has not changed the rate—$1.25 being the basis of current negotiations on head-of-the-lake business. It is a question, with the heavy vessel engagements for ore, how any considerable grain movement will be taken care of. It is not improbable that some of the ore tonnage taken, that has seemed to be in excess of the actual requirements of the chartering interest, will be diverted to grain when the rate for the latter is established at a relatively profitable figure.

PIG IRON.—None of the large steel companies has made purchases of Bessemer iron for the third quarter, but it is understood some business has been done, perhaps to the extent of 20,000 or 25,000 tons, at $24, valley furnace, for delivery after July 1. That is the basis on which the association furnaces expect to do business for the third quarter. A few sales made recently below $24, valley, and reported offers at a considerable concession, are attributed to steel works, in an effort to break the market. The starting up of one of the 600-ton Youngstown furnaces adds by that much to production, but it is to be considered that the New Castle steel plant has been shut down for weeks while metal from adjoining furnaces was carried to Youngstown to keep the steel plant there in operation up to full capacity. The second of the Ohio works furnaces is not expected to be in blast until the latter part of April. The calculations made last year of increase in the output of Bessemer iron in 1900 are scarcely being realized. Furnaces only begun last year need not be expected to figure at all in 1900 production, or at least very late in the year, though early estimates counted that they would be producers by the middle. Foundry and forge irons have been quiet. There is steady inquiry from foundries, and sellers find evidence that purchases will have to be made in not a few cases from two to three months earlier than advices heretofore have indicated. We quote gray forge at $21 to $21.50, valley, for Northern and $20 to $20.25 for Southern. Cleveland quotations follow:

Bessemer	$24 00	Valley Scotch No. 1	$23 00@23 50
No. 1 Strong Foundry	23 00@23 50	Valley Scotch No. 2	22 50@23 00
No. 2 Strong Foundry	22 50@23 00	Gray Forge, valley	21 00@21 50
No. 3 Foundry	21 50@22 00	Lake Superior Charcoal	25 00@26 00

FINISHED MATERIAL.—A rate of consumption that would excite remark in an ordinary time, with small lot orders and specifications steadily coming in, is accompanied by the same hesitation that has been in evidence for three months. It is the belief of sellers, who have watched closely the character and frequency of buying and noted how it is spread out through the diverse consuming lines, that the impulse that will be given by the season of outdoor operations will promptly strengthen the temporarily weak spots. On the other hand the possibility of interruption through labor troubles is an element of uncertainty. In the past week there has been some buying for future delivery in bars, at substantially the prices quoted heretofore. While 2.15c, valley mill, is generally maintained, that price has been made also on Cleveland deliveries. From store the Cleveland price is still 2.50c, half extras. Steel bars are firm at 2.35c, delivered Cleveland. Some further vessel plate business is being figured on. The 4,000 tons of plates and shapes referred to last week has not been placed, but the plates will go to Cleveland and the shapes to a Western Pennsylvania mill if the order for the boat is given. A Toledo boat is also being figured on. In actual transactions 2.20c, Pittsburg, for tank steel appears to be the minimum, though buyers are intimating that lower bids are available. One mill in particular seems to be making low prices. In the case of the largest producer of plates 2.25c, Pittsburg, for tank is the lowest quotation made. Light plates that were almost unattainable in the second half of 1899 are now eagerly accepted by certain mills, at prices close to those for heavy plates. The sheet market is strong at 3.05c, Pittsburg, for No. 27. Mills not scheduled for the consolidation are in line with the advance because of their heavily sold condition. Pipe continues active, the announcement of an intended advance securing the closing of a large tonnage that might have been spread over several weeks. Structural material is quiet at 2.35c, Cleveland, for beams up to 15 inches and 2.35c to 2.45c for angles, according to size. The mills are sold for months ahead, for their production of angles, and the pressure in this line shows no signs of easing.

WIRE AND WIRE NAILS.—Demand is only fair. Local production has increased with the return of the striking rod mill men to work. Buyers are in the market from time to time, but the usual large orders for the spring trade are yet to be placed. We quote the Cleveland market to retailers in car load lots: Wire nails, $3.45; smooth wire, $3.30; painted barb wire, $3.90; galvanized, $4.05.

OLD MATERIAL.—The effects of the recent congestion of scrap at the valley mills of the leading buyer is still in evidence, and the market for mill scrap is flat. Foundries are buyers, however; steel scrap is also in active demand at good prices. We quote machinery cast scrap at $15, delivered; cast borings at $11.75; wrought turnings, $14; busheling scrap, $17.50 to $18; No. 1 wrought scrap, $22; old steel rails, $22; old car wheels, $24—all gross tons.

CINCINNATI.

Feb. 21.

The finished material market shows easy prices for plates and firmer conditions in sheets. Mill shipments are made

on a basis of 2.25c for bar iron in carload lots and 2.35c, half extras, for steel bars; angles, 2.55c; No. 27 sheets, 3.30c; tank plates, 2.40c to 2.50c. For small lots $2 a ton higher is asked. The pig iron market is thus reviewed by Rogers, Brown & Co.:

"Northern irons are strong, becauses the furnaces are quite well sold ahead, many of them for the first half of the year, and a few to the third quarter of the year. Bessemer is scarce and firm at $24, valley furnaces. Gray forge is in more active request, and $21 to $21.50, f. o. b. Mahoning and Shenango furnaces, represent transactions of the week, with light supply. As to foundry grades, the Northern furnaces are not anxious for orders for immediate or early delivery, but are booking for extended future deliveries. The Southern furnaces are still far behind deliveries on all grades, and the few old furnaces that have been revitalized have thus far been disappointing as to tonnage and grades produced. So that the general situation has not improved much as to Southern production.

"The year yet young gives promise of a marvelous development and a prosperous future. The indications favor the belief that the plethora of money, established confidence, domestic development and the enlargement of our exports will continue to tax our facilities as to iron and steel and their products. Transactions of the week comprehend sales of every variety of domestic pig iron, and in a slightly increased volume over last week. Owing to the labor difficulties occasioned by the holidays, and the inadequate supply of coke, and therefore the irregluar working of the furnaces in the South, some off grades have been made, but these little accumulations have been disposed of. The furnaces are working now in fairly good order, and while No. 2 foundry continus very scarce, the outlook is improving for a better supply and the market closes in better form, with firmer figures, than prevailed at our last writing."

Matthew Addy & Co. say: "Business during the past week shows a considerable improvement in the volume of orders booked. There was the usual steady run of carload lots and in addition several round lot orders for long forward delivery were placed. These amount to in excess of 13,000 tons and they were taken at full schedule prices. It is apparent that there is a very great scarcity of No. 2 foundry and No. 2 soft for quick shipment. It is practically impossible to get these grades for immediate delivery, in fact the Southern furnaces are so far behind contract obligations that it would be a relief to them if no demands were made on them in the way of new business for the next 90 days. It is absolutely certain that the next general buying movement will demonstrate the fact of a shortage in Southern pig iron. Here and there in the North we find a foundry well equipped with iron in stock, but the majority of them are situated precisely as they were last year. That is, they have not been able to accumulate a stock and are continually on the point of having to shut down because of a lack of pig iron. In fact many consumers have suffered severely from this cause."

We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $21.75; No. 2 foundry, $20.75; No. 3 foundry, $19 25; No. 4 and gray forge, $19 75; No. 1 soft, $21.75; No. 2 soft, $20.75; Lake Superior coke No. 1, $23.25 to $23.75; Lake Superior coke No. 2, $22 25 to $22.75; Hanging Rock charcoal No. 1, $25 to $26; Jackson county silvery No. 1, $30 to $31; Standard Georgia car wheel, $24.75 to $26.25; Lake Superior charcoal, $25.50 to $26 50.

PHILADELPHIA.

Feb. 20.

Such buying of pig iron as there has been in the past two weeks has been for the most part at inside prices, but neither orders nor concessions are of any size. The foundries are practically bare of stocks, and standard irons are being consumed as fast as made, so that the situation does not shape itself very rapidly. Buyers generally are watching for a break in prices that does not come and every week brings the trade nearer to the season when operations are expected to be on a larger scale than today's, and with the arrival of spring sellers believe the present halt will be quickly ended. The expectation of buyers that they can contract for the second half of the year on a basis considerably below the top is based in large part, it appears, on the idea that when a high price has been maintained for two or three months, the only course open to the market is to recede. The argument seems to be that as everybody is persuaded that prices are high enough, and most members of the trade that they are too high, nothing is lost by waiting, while the possibilities of gain are largely with that course. The average buyer, therefore, expects to be given a good round concession for placing his order now and he does not get it. The every day transactions of the past 10 days have been at prices not uniform by any means, and they represent from 50 cents to $1 less than the quotations of December. But to say that the market is easier does not carry any vindication to the prophets of a slump. One thing is plain. There is no slump, only such a relaxation as indicates that both sides are feeling the way and are not sure of the next turn. We quote No. 1 foundry at $24 to $25 for standard brands; No. 2X foundry, $22.75 to $23.50; No. 2 plain, $21.75 to $22.25; gray forge, $20 to $20.50. Muck bar is low for the present prices of forge iron and makers are complaining of a market that remains about $30 to $30.50 at seller's mill. In the Harrisburg district one mill has stopped, waiting for muck bar to advance or for pig iron to fall. The billet market has eased and orders have been placed at $36, buyers gaining substantially $1 a ton by their long wait. Makers are quoting $36.50 seaboard or equivalent deliveries. Indications are that mills will soon have large offerings of business. Winter orders have been of unusual volume and prices for the most part have been well maintained even with so complete a change from the conditions of one year ago. The trade in bars has been excellent in the past week, though there is not strict agreement in prices. There is a good degree of activity in plates, though it does not seem certain that the bottom has been reached. Capacity is increasing, and this is true also of consumption, and three months hence may find a considerably firmer condition. We quote tank plates at 2.25c to 2.35c, at mill; best refined bar iron, 2.15c to 2.20c; steel bars, 2.35c to 2.45c; angles, 2.40c to 2.50c; beams and channels, 2.40c to 2.50c; No. 27 sheets, 3.10c to 3.20c. The old material market is somewhat irregular, with easier prices in some lines. We quote: Choice railroad scrap, $23 to $25; No. 1 yard scrap, ordinary, $19 to $20; No. 2 light scrap, $14 to $15; machinery cast, $17.50 to $18.50; heavy steel scrap, $22 to $23; old iron rails, $26 to $28; old steel rails, $22.50 to $23.50; wrought turnings, $15 to $15.50; cast borings, $13.50 to $14; old car wheels, $21 to $22; iron axles, $27 to $29; steel axles, $25 to $27.

The Lukens Iron & Steel Co., of Coatesville, Pa., is working night and day to fill plate orders, and is quite well booked up to summer months. Its mills are especially busy on bridge material.

The Blue Mountain Iron & Steel Co., having its main office in the Bullitt Building, Philadelphia, will put its Catoctin Furnace, located in Frederick County, Maryland, in blast March 5. The furnace has been enlarged so that its daily capacity is 60 tons. The company is now offering its high grade foundry iron for delivery in the second quarter.

FOREIGN IRON AND STEEL MARKETS.

British iron and steel market reports of Feb. 10 refer to the strength and steadiness of pig iron prices. In finished branches there is continued activity, accompanied by a rise in prices in Staffordshire and Middlesbrough. An unusual condition was noted for a few days in the warrant market, Cleveland warrants being higher than Scotch, while the usual difference is about $1 a ton the other way. In Middlesbrough, ship plates have gone up 60 cents, making the quotation $39.40 a gross ton, while boiler plates are $45.50. In South Staffordshire billets and blooms have advanced to $39. Black sheets for galvanizing are quoted at $54.50. In North Staffordshire common bars have advanced to $51. No. 3 foundry iron at Middlesbrough is now quoted 25 cents higher, or at $17; Scotch warrants at $16.75; hematite warrants, West Coast, $18.50. The market for Cleveland pig iron is reported exceptionally active. Shipments of iron from the Cleveland district, ordinarily about 5,000 tons in January, were 15,570 tons in January, 1899, and 22,702, or more than four times the usual, in January, 1900. In Belgium and France, also, there were remarkable increases. South

Staffordshire marked bars remain at $55 to $56 gross ton and common bars at $50 to $51. Steel rails are $34.50 at Middlesbrough and $34 on the West Coast.

Glasgow reports refer to conditions in the United States, which raise the question whether the States are nearing the end of the present boom and add: "With the home position strong and the Continental demand better than for years, it is only a fear of a break in the American position that leads to any apprehension. The fear has created a feeling of hesitancy, for there is no question that the future strength of our home market depends upon how long American competition is kept down." The inquiry for export in the Glasgow market continues. Belgian and German makers are so swamped with business that orders that for years have gone to them are now being placed in Scotland.

Reports from German iron markets, dated Feb. 6, say that in view of the increasing cost of iron ore and coke the Pig Iron Syndicate in Rhenish Westphalia had put up German Bessemer pig $1 a ton, or to $24.50; Thomas pig from $21 to $22, German foundry No. 1 from $23.50 to $24.50 and No. 3 from $23 to $23.50.

The Belgian iron market continues very strong and the outlook is reported satisfactory notwithstanding the high level of prices. Pig iron quotations have advanced the past month: Charleroi puddling pig, from $21 to $25; Luxembourg puddling pig is now $22 and Thomas pig $22.

In the Austrian market the favorable tone continues, the chief drawback being the lack of fuel, due to the strikes of miners in Bohemia and Silesia. Three large concerns have issued circulars saying that the strike has compelled them to put their works on short time. The mine operators insist upon the men returning to work unconditionally before they will enter into negotiations.

RECEIVED FROM THE TRADE.

In a list recently sent out Fraser & Chalmers, of Chicago give the names of users of their Riedler compressors and blowing engines, the former being employed in connection with mining operations while the latter has been adapted for use at converting plants.

The latest mail card of the Philip Carey Mfg. Co., Lockland, O., illustrates the Carey coverings as applied to steam and hot water pipes, stationary and locomotive boilers and ammonia, brine and oxide pipes.

The Aultman Co., of Canton, O., devotes the bulk of a catalogue it has just issued, to its rock crushers and road machines. The crusher, which is a new product of this company, has been illustrated and described in detail in these columns. In connection with it are shown the Aultman elevator for the rapid handling of crushed material, the Aultman rolling screen and the Aultman chute screen. Portable engines and road machines and scrapers are also illustrated. The Aultman company contracts to design and erect complete plants for mining, conveying, crushing, screening, or washing any rock or ore subject to such processes.

A newly issued catalogue of the New York Air Compressor Co. contains illustrations and descriptions of standard sizes of New York air compressors, actuated by steam, gas or gasoline engines, belt power, or water-wheel, together with hints of value to users of compressed air power. The information and tables which the catalogue embodies, gives it an especial value as a book of reference. The company promises the early issue of a more elaborate and voluminous catalogue now in course of preparation. All the literature issued by this company is mailed upon application to its main office, No. 120 Liberty st., New York.

A particularly attractive pamphlet, "About Boiler Compounds," has been published by the Sumac Co., of Rochester, N. Y. The Sumac compound for the prevention of scale is discussed, with the aid of marginal illustrations. The company notes that one customer used 64 barrels and another 60 barrels in 1899 and a considerable number over 25 barrels.

A pamphlet of the Marine Iron Works, Station A, Chicago goes into details of the design and construction of stern paddle wheel steamboats, such as this company builds for navigating shallow waters. The proposition is made in the pamphlet that the company will make and ship all the material for a complete river steamboat, so far finishing it that any good millwright will be competent to perform the construction work. This has been done with boats they have sent to foreign countries. Another method used with success is employed where purchasers are at points distant from boat yards, but have all material at hand needed for the hull. In these cases the company makes designs and specifications and furnishes details. All machinery is supplied and other equipment, with setting plans. Boats thus built by this company range from 50 to 125 feet in length, carry from 9 to 100 tons on a draft of 20 to 30 inches. Complete details for such boats are given, with other valuable suggestions.

The Illinois Cutlery Co., Decatur, Ill., manufacturer of kitchen specialties, gives in a handy memorandum book and descriptive leaflet illustrations and advantages of a number of its utensils, which are carried by hardware and novelty stores.

Under the title "The Control of Heat," Uehling, Steinbart & Co., Ltd., of Carlstadt, N. J., publish a pamphlet dealing with their pneumatic pyrometer. This instrument has been in use since 1894, and in its present form since 1897. It has endured continuous exposure to heat, varying from 100 degrees to 2,500 degrees for over two years. In recording temperatures at blast furnaces, in gauging heat in annealing and tempering furnaces, and in testing and laboratory work, the pyrometer has found a wide field of service. In connection with the catalogue the manufacturers present several sheets reproducing autographic temperature records from instruments in use.

Catalogue No. 102 of the Northern Engineering Works, of Detroit, illustrates their Tandem gas and gasoline engines. Without dwelling on general claims, the pamphlet gives a detailed description of the engine in its mechanical details. There are two single acting cyliders placed tandem, each operating alternately on the four cycle principle. This secures an impulse every revolution, as compared with an impulse every second revolution in the single cylinder engine. The dimension diagrams give full data regarding horse powers and tables of weight, speeds, etc., are given; also a number of extracts from letters presented as evidence of the success of the engine. The catalogue lists engines from 10 to 50 h. p. (actual). It is 6x9 inches.

"Stresses of Swinging Bridges," was the title of the paper read by Willis Whited at the regular meeting of the Engineers' Society of Western Pennsylvania, held at 410 Penn ave., Pittsburg, Tuesday evening, Feb. 20. The following applications for membership were favorably acted upon: Francis Herbert Brown, of the Brown & Zortman Machinery Co., Pittsburg; Milnor P. Clark, draughtsman, with Julian Kennedy, mechanical engineer; Elliott M. Sergeant, draughtsman, with the Westinghouse Electric & Mfg. Co., East Pittsburg, Pa.; William J. Webster, manager of the Pittsburg office of the Hercules Powder & Atlantic Dynamite Co. New Jersey; Charles W. Wright, superintendent of the Aliquippa Steel Works; Edwin Yawger, mechanical engineer, with Westinghouse, Church, Kerr & Co., Pittsburg. The chemical section of the society will meet Thursday evening. A paper will be read by James M. Camp, entitled "Volumetric Method for the Determination of Magnesia."

THE wire nail and rod mills of the American Steel & Wire Co., New Castle, Pa., will start up next Monday. The mills were shut down some time ago and their resumption means the employment of several hundred men.

BY request of complainant's attorneys, in the suits pending in the United States Circuit Court of Allegheny county, involving a patent method of casting and conveying metals, in which the Carnegie Steel Co., Ltd., is the plaintiff and the Cambria Steel Co. and Heyl & Patterson are defendants, a dismissal will probably be entered in order to permit of filing new suits. It was learned that no notice of infringement had been served on the defendants, and in order that this may be done the request for dismissal was made.

THE new bar mill of Jones & Laughlins, Ltd., Pittsburg, was put in operation this week. Rounds and squares will be the product. Rounds from 2 to 6½ inches will be rolled.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET.
G. H. GARDNER, President. A. I. FINDLEY, Editor.

CHICAGO:
1522 MONADNOCK BLOCK.
B. M. GARDNER, Western Manager.

PITTSBURG:
1125-26 PARK BUILDING.
A. O. BACKERT, Manager.

Subscription (strictly in advance), $3 per annum. Foreign Rate, $4.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

FEBRUARY 22, 1900.

PERSONAL.

Willard Fuller, superintendent of the Lorain Steel Co.'s blast furnaces, at Lorain, O., was compelled by ill health to take an indefinite leave of absence recently.

Col. H. A Marting, president of the Marting Iron & Steel Co., Ironton, O., has given $10,000 to the German Wallace College, of Berea, O., to found a professorship in that institution in honor of his parents.

Henry M. Curry, who withdrew from the board of managers of the Carnegie Steel Co., Ltd., some time ago, on account of ill health, is reported to be seriously ill at his home in Pittsburg.

F. G. Coffeen, formerly with the Deering Harvester Co., Chicago, has connected himself with the Duluth Foundry & Machine Co., at West Duluth, Minn., where he is in charge of the plant. The company manufactures malleable and gray iron castings and does some machine work. Mr. Coffeen's extensive experience as a chemist in the malleable foundry of the Deering company will make his services valuable in his new position.

S. W. Croxton, of Cleveland, president of the Penn Iron & Coal Co., Canal Dover, O., sailed Feb. 10 for an extended trip in Europe. Mr. Croxton was accompanied by the members of his family and they will spend about six months on the Continent, expecting to return from Paris about July 1.

Alexander Gordon, of the Niles-Bement-Pond Tool Co., sailed for Europe this week. In about two months, it is expected, the Niles works, now under construction near Berlin, will be finished.

Robert McCance, of New Castle, Pa., was appointed auditor last week of the American Steel Hoop Co., with headquarters in Pittsburg.

E. A. Uehling, who is now at Middlesbrough, Eng., representing the manufacturers of his pig iron casting apparatus, read a paper before the Cleveland Institution of Engineers recently on "The Pneumatic Pyrometer and Autographic Recording Gauge."

A. R. Hunt, superintendent of the 119 inch plate mill of the Homestead Steel Works, who at the first of the year was made a partner in the Carnegie Steel Co., Ltd., has been placed in charge of all the plate mills at Homestead.

John S. Fackenthal, of Easton, Pa., has succeeded H. B. Weaver as superintendent of Durham Iron Works furnace at Riegelsville, Pa. Mr. Weaver has resigned to take a similar position at Allentown, Pa.

F. W. Newson, a civil engineer of London, Eng., was in Pittsburg this week, visiting the larger steel plants. He is connected with Pauling & Co., contractors for a 60-mile railroad and other improvements to be made in British North Borneo. He arranged with the Carnegie Steel Co. for the shipment of the rails, and placed the contract for bridges with the Keystone Bridge Co.

President C. S. Guthrie, of the American Steel Hoop Co., sailed for Europe this week and will be absent six week. The extension of the foreign business of his company is planned and an office in London may be opened.

Adolph Sonnenschein, chief engineer of the Witkowitzer Bergbau and Eisenhütten Gewerkschaft, of Witkowitze Austria, has been visiting steel works in the Pittsburg, Cleveland and other districts. Equipment from American firms will shortly be installed at the company's plants. Mr. Sonnenschein sails on Saturday on the Campania.

At the annual meeting of the Stilwell-Bierce & Smith-Vaile Co., at Dayton, O., Feb. 14, J. H. Vaile was elected president to succeed R. N. King and E. F. Platt was elected treasurer in place of F. H. Jones.

THE COST OF MALLEABLE CASTINGS.

TO THE EDITOR:

My attention has been called to Mr. P. H. Davis's note in *The Iron Trade Review*, of Feb. 1. My estimate of the probable cost of producing malleable castings by a favorably conditioned concern, doing business on a large scale, is based primarily upon the known cost for a period of one year in a small concern at a time when iron was $19 a ton. The cost was considerably less than 3 cents a pound, and it was known to be much greater than the price at which malleables were then being produced by large concerns. This was more than a decade ago. Since then great economies have been effected in the various processes attendant upon the manufacture of malleables. The molding machine has helped to reduce the cost of molding. One manufacturer has told me that he uses not more than a third as much fuel in melting in the air furnace as formerly, and that he melts the iron at less cost than would be possible in the cupola. Another manufacturer avers that three days' firing now suffices for the annealing of light malleables, whereas formerly this process occupied six days.

Now in my estimate of present cost, I assume that these economies will offset in a large measure the difference between the cost of iron now and then. And I am frank to say that it is purely an estimate, and not based upon practical knowledge of all the conditions now prevailing. I have taken the word of men now engaged in the business, with regard to the economies above mentioned, together with my own knowledge of the business in a former period, and drawn conclusions therefrom. And I see no reason to doubt that cupola malleables can be produced today, on a comparatively small scale, at less than 3 cents a pound, and air furnace malleables upon a large scale, at even less cost, provided what malleable iron manufacturers say is true.

With regard to the relative merits of the cupola and the reverberatory furnace, there is no question that the latter is the superior. This has been my position from the start. But I refer to the cupola as practicable under circumstances where the reverberatory furnace could not be used with economy, viz.: where the output is small.

It is no doubt true, as Mr. Davis says, that the processes in malleable manufacture are not now kept secret as formerly. But that in all the past, until quite recently, a "veil of mystery has enshrouded the art," cannot be denied. I could adduce evidence that some manufacturers still guard their processes with very jealous care, but that would necessitate personalities, which I will not employ. I should be extremely sorry if what I have written should cause embarrassment to any superintendent, or other person, but so long as manufacturers hide the cost of product, we shall have to estimate it as best we can.

There is one point that has not yet been considered, and that now occurs to me as having an important bearing upon the problem of cost. It would be interesting to know to what extent patterns have been lightened during the last 10 years. It is possible that this feature, though not in itself increasing the nominal wages of the workman, may advance materially the cost per pound in wages, and this neutralize to some extent the advantages accruing from the use of machines.

E. H. PUTNAM.

THE IRON AND STEEL STOCKS.

Denison, Prior & Co. in their weekly iron and steel letter say: "'The time money market remains quiet and unchanged. Rates are quoted at 4½ per cent for 90 days to six months on first class securities, and 5 per cent on all industrial collateral.' The above quotation from Dow, Jones & Co.'s News Bureau is a fair indication that discrimination against industrial stocks as collateral is again under way. The recent boom in the steel stocks started under the leadership of the common issue of American Steel & Wire Co., and it seems impossbile for the bull pools in the stock to force their issues to a higher level. The litigation in the Carnegie Steel Co. has been taken as a bull argument, the bulls maintaining that the large earnings show the possibilities of iron and steel corporations, while the bears hold that this same showing is only fresh ammunition to be used in fighting the trusts. At any rate, the market did not respond as the bulls expected on the discussion of the large earnings of the Carnegie company.

"It is feared that the prosperity in the iron trade will naturally result in labor difficulties. This has generally been the case in former years, and there is no reason to suppose that history will not repeat itself in this case. The stockholders of the American Steel & Wire Co have unanimously voted to adopt the proposed amendments to their articles of incorporation. These amendments permit the company to build and operate railroads and enlarge its powers of operation in other directions. They also authorize the cancellation of part of the preferred stock. There was no marked response in either issue of the company to this action of the stockholders. It is the same with the steel stocks as in other parts of the list. Good news falls flat, and bad news merely increases the heaviness."

The table below shows the changes in the iron and steel stocks in the week ending Feb. 19, also the high and low points for the year:

Name.	WEEK.				YEAR.				
	Open	High	Low	Close	High.		Low.		
Am. Car & Fdy	16¼	16⅜	15	15⅜	18	Feb. 7	12½	Jan. 15
Am. Car & Fdy pr.	63¼	64	63	63¼	66	Feb. 6	59	Jan. 29
Am. Steel & Wire..	57½	59¾	57	58¾	59¾	Feb. 15	45¼	Jan. 15
AmSteel & Wire pr	93⅜	94	93¼	93¾	95	Feb. 1	89	Jan. 15
Am. Steel Hoop.....	47	48½	45⅝	46	50½	Feb. 6	41¾	Jan. 7
Am. Steel Hoop pr	85	85	84¼	84½	86	Feb. 6	80	Jan. 23
Am. Tin Plate.....	34	35	33⅜	34⅛	36½	Feb. 7	27⅜	Jan. 29
Am. Tin Plate pr..	84	84	83	83	84	Feb. 16	80⅛	Jan. 12
Col. Fuel & Iron...	46	47½	44½	45¼	48½	Feb. 6	40½	Jan. 8
Federal Steel.....	55⅛	56⅜	54⅜	54⅜	57¾	Feb. 6	47¾	Jan. 11
Federal Steel pr....	75½	76½	73	74½	77½	Feb. 6	70¾	Jan. 10
National Steel.....	50	51½	48	48¾	53⅛	Feb. 6	40	Jan. 26
National Steel pr..	96¼	97	95¾	95¾	97	Feb. 6	92	Jan. 9
Pressed Steel Car..	56	57¼	56	56¼	58¾	Jan. 17	55⅜	Jan. 26
PressedSteelCar pr	87	87¼	87	87¼	88½	Jan. 17	85½	Jan. 9
Republic Steel	25	25¾	23½	23¾	27½	Feb. 6	19⅜	Jan. 15
Republic Steel pr..	68¼	69	68¼	69	70¾	Feb. 6	64¾	Jan. 18
Tenn. Coal & Iron	96½	102¼	96½	99½	104	Feb. 2	79¾	Jan. 11

Notes.

At a meeting Feb. 16 of the executive committee of the Tennessee Coal, Iron & Railroad Co., a plan was agreed upon for the retirement of the $1,000,000 of 8 per cent cumulative preferred stock, and the payment of 54 per cent of accumulated dividends. The plan will be submitted to the stockholders at the annual meeting March 14.

The Pressed Steel Car Co., Pittsburg, has just paid 1½ per cent dividend on the common stock of the company, the first installment of the 6 per cent dividend declared by the directors last month.

At the annual meeting of the American Steel & Wire Co. at Jersey City, N. J., Tuesday, Feb. 20, Alfred Clifford was elected a director for one year in place of F. B. Vorhees, and the following were elected directors to serve five years: Thomas Dolan, G. B. Ward, James Hopkins, J. A. Drake and Charles Boynton. The stockholders unanimously voted to adopt the proposed amendment to the articles of incorporation which permits the company to build and operate railroads and to enlarge its power of operation in other directions. An amendment was also adopted, authorizing the retirement of part of the preferred stock. Chairman Gates submitted an address in which he said in substance that the amount of $1,200,000 reserved for depreciation and losses in bad debts in the annual report was arbitrary. As a matter of fact, the plants and properties have been increased in value by improvements which have been charged to the expense account. The bad debts up to the present time are less than $10,000. The economies resulting from the combination have been fully up to the expectations. The exports for the first two months of 1900 show a material increase over the same period of 1899. Out of the exports in 1899 to the value of $9,000 000 there was paid to labor over $4,000,000 and 7,000 men have been continuously employed by this export business.

The report of the National Tube Co., submitted to the meteing Feb. 20, states that the company's foreign trade is increasing, and that an important foreign contract has just been closed for supplying the city of Guadalajara, Mex., with its entire steel pipe system of more than 40 miles. The report states that "the merchandise and material on hand are now the largest in this company's history, preparatory to the opening of the spring season. The cash resources are estimated at over $18,000,000 net, including over $5,500,000 in actual cash. The company has no outstanding bonds, mortgages, or liens of any description, and it pays cash for all purchases of supplies or other commodities. Since the company commenced operation July 1 the number of individual stockholders has increased about 40 per cent. The net earnings of the corporation for the first six months of its operations July to December, 1899, inclusive, were $7,909,060. From this must be deducted two dividends on preferred stock at 1¾ per cent each, $1,400 000, leaving as the result of six months' business, after paying six months' dividends on the preferred stock, $6,509,060."

Carnegie Steel Co. Additions

The Carnegie Steel Co. this week awarded the contract for the contsruction of the great steel bridge across the Monongahela, to connect the Carrie Furnaces with the Homestead Steel Works, to the Drake & Stratton Co. and the Keystone Bridge Co. The will be cost about $500,000 and it will be the heaviest structure of its kind across this river. The Drake & Stratton Co. will build the masonry and are under contract to have the five heavy piers, each 53 feet high, in place within 90 days. The bridge, designed by W. H. Smith, chief engineer of the Union railroad company, will be more than one half mile in length, including the approaches. There will be six spans to the structure. The main span across the Monongahela channel will be 500 feet in length, while another span will be 252 feet long. There will be four other spans each 120 feet long. A steel viaduct approach 1,000 feet long will be erected at the Rankin end of the bridge and on the Munhall end will be a "Y" with steel approaches leading up and down the river, each 500 feet long.

The company has under contemplation the enlargement of its works at Duquesne, but what the addition will consist of cannot be learned at this time. Several residents occupying property owned by the Carnegie Steel Co. at this place have been notified to vacate April 1. Abut a dozen buildings will be razed to make room for the contemplated additions.

The Sheet Mill Consolidation.

It is now announced concerning the projected sheet mill consolidation that a different basis for the division of stock has been decided upon. The capital is to be $52,000,000, of which $12,000,000 in preferred and a like amount in common will be paid the owners of the mills to be combined. The promoters are to pay $4,000,000 for that amount of preferred and a like amount of common stock. The remaining $20,000,000, half preferred and half common, is to remain in the treasury for the acquisition of plants not now under option. The $12,000,000 worth of common stock to be issued to stockholders in the constituent companies will be placed in trust with the First National Bank of New York, for one year.

RUMORS of further changes in the personnel of the Carnegie Steel Co. management appear to be set at rest by the re-election last week of the present board of managers.

The National Steel Co. is reported to be negotiating for the Spruce and Cloquet mines near Eveleth, on the Mesabi range. The Spruce is owned by the Spruce Mining Co., and is the old Eveleth townsite. There are two forties and a 50-year lease was taken last year by P. L. Kimberly, of Sharon, Pa., and associates. The deposit has been proved up, it is reported, to the extent of 80,000,000 tons. The royalty is 3 cents. The Cloquet location includes 16 acres. The mine was known originally as the Vega.

A DEVICE FOR SAMPLING PIG IRON.*

BY PORTER W. SHIMER.

The device here described has been found useful in sampling foundry iron, and there is no reason why it should not be equally useful in sampling other metals, which are not too hard to be drilled with a breast-drill. It consists, as shown, in Figs. 1 and 2, of an ordinary plumber's gas T (without bead) of about ½-inch in internal diameter, over the leg of which is snugly fitted a small tin cup, about 1¾ inches deep, to catch the drillings which are made by use of a breast-drill with a ¼-inch twist bit, working through the arms of the T. The forward arm of the T is filed down to a blunt edge, over which is stretched a short piece of rubber tubing projecting a little beyond the end. The bottom of the inside of the front arm of the T is filed down to a slope, to facilitate the passage of drillings into the tin cup. The rear arm of the T is fitted with a tin ring, projecting about ¼-inch, for

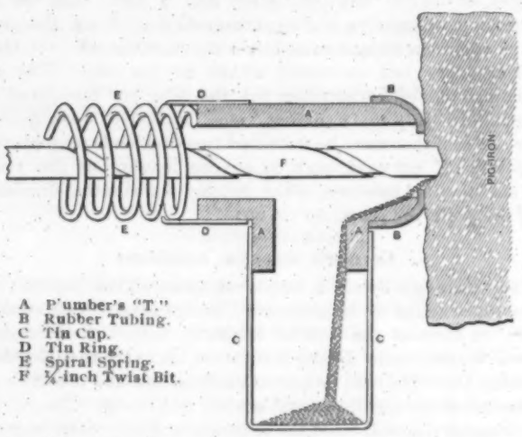


FIG. 1.—LONGITUDINAL SECTION OF DEVICE FOR SAMPLING PIG IRON

the purpose of holding in place a stiff spiral brass spring, which serves to press the sampler firmly against the metal to be drilled. The other end of the spring is supported against a shoulder of the breast-drill. The projecting rubber prevents the loss of any drillings, and also the falling of sand from above into the sampler. With ordinary care there need be no risk of getting particles of rubber into the sample.

It is, of course, not possible to get a fair average sample of drillings, representing a pile of foundry iron, by taking drillings from any one or two pieces, because of the frequently mixed character of the iron. This observation applies more particularly to the sampling of iron as it is broken and piled at the foundry, than to sampling at the works, where, if the furnace is working regularly, a few pigs may fairly represent

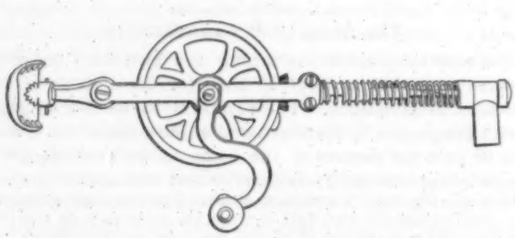


FIG. 2.—BREAST DRILL, WITH SAMPLING DEVICE ATTACHED.

a whole cast. By the use of this device, it is possible for a sampler to pass along a pile of pig iron and take a little from each of 10 or 20 or more pigs, by drilling a hole about ⅛-inch deep into each. A great advantage is that the drill holes may be scattered all over the fractures, making one hole in each piece, but in a different part of each. In this way, inaccurate sampling, whether due to an insufficient number of pigs or to any segregation in individual pieces, is readily avoidable. It is necessary to brush off the fractures before drilling, to remove any adhering sand. It is also necessary to take as nearly as possible the same amount from each piece; otherwise the holes drilled into softer pieces will, very naturally be deeper than those drilled into the harder pieces. When we remember that the softer pig iron usually contains more silicon and less sulphur than the harder, the importance of this precaution is apparent.

* Read at the Washington meeting, February 20, 1900, of the American Institute of Mining Engineers.

A BRITISH STEEL MASTER'S VIEWS.

John Darby, managing director of the Brymbo Steel Co., Wrexham, North Wales, was in Pittsburg this week, on a tour of inspection of a number of American steel plants. He arrived in New York two weeks ago and before going to Pittsburg, visited Birmingham, Ala. He will return to England within two weeks, and in the interim will visit the steel plants at Youngstown, O., and those located at Johnstown, Pa. Mr. Darby's visit to the steel plants of this country is for the purpose of ascertaining the methods in vogue, with a view to introducing them and possibly American machinery in his plant.

The Carnegie rail mills at Duquesne were a surprise to him, particularly the continuous work on certain sections, runs of weeks being not uncommon. He further expressed surprise when informed that a number of roads have adopted rails of the same section. "In our country" he said, "the engineer of every road has his own notion about the section of the rails that are to be laid and, the result is that with numerous small orders, from different roads, it often happens that the rolls have to changed several times daily. This, of course, is only in extreme cases, but is a good example of what the rail mills are forced to contend with. While I have been informed that you have no standardized section, your mills receive orders for such an enormous tonnage of a certain section that the frequent changing of the rolls is not necessary. For this reason, if for no other, I believe that the American competition in rails will be but slightly felt. Your mills here would not be troubled with numerous small orders of rails of different sections, for the very reason that it would greatly increase the cost of their manufacture. What I have said about rails holds true about locomotives. Every railroad has often a half dozen types in use and each one of these differ in construction from those in use on other roads. Some years ago when American locomotives were introduced in England, and their prompt delivery was one of the chief comments. It was said that the Americans can build locomotives faster than our own people. It was not that they could build them any faster, but because certain locomotive works build certain types and the railroad companies purchase them in lots. In England when an engine is ordered the design is furnished the builder and he is compelled to construct accordingly. It is here that the great delay and increase in cost are occasioned.

"There is comparatively little steel used in England today for structural purposes. It has just come into use and will open up a new avenue for the steel trade. I was informed that there is a movement on foot to standardize the gauges of American structural material and I hope that the English engineers will first of all standardize and then construct. However, I do not believe that this will be the case." Mr. Darby stated that the product of his plant consists principally of soft steel billets. Instead of tests being made of each heat as is the general method in vogue in American steel plants, each ingot is tested. These tests are not made by the concern manufacturing the steel but by an inspector employed by the concern to whom it is to be delivered. At the present time England is enjoying an unparalleled era of prosperity in the iron and steel trade. The war with the Boers, however, has drawn so many men from the fields of industry that serious strikes are impending, especially among those employed in the iron and steel industry, who become more persistent in their demands for increased wages as the number of available men in England decreases. Mr. Darby is of the opinion that this country controls the English iron and steel market. "When prices are high in America, and the demand for iron and steel is good, the exports to England are almost nil. As soon as the American market breaks and prices begin to fall, and the demand decreases, the Amerian producers begin to unload their product in England and the result is that the English market falls and often to a level lower than the American."

TO TEST THE PRACTICABILITY OF GRADING PIG IRON BY FRACTURE.

TO THE EDITOR:

That we occasionally find intelligent and capable men like Dr. Edward Kirk appearing in print to champion the old school method of grading pig iron, as seen in the last issue of *The Iron Trade Review*, in the face of experiences demonstrating its impracticability, will appear to many rather strange. The Doctor says: "The characteristics of pig iron are as accurately indicated by the fracture to the man who has acquired the art of judging iron by fracture, as they are by chemical analysis." I for one am pleased to see such a broad statement made, for if there are men able thus accurately to judge fractures, it will greatly help to settle the existing difference of opinion on this subject. But right here I wish to say that in my opinion neither the Doctor nor any expert he may name can sustain the above claim. The best way I can think of to give him a chance to test this question is as follows:

I will collect 20 to 30 samples of clean fractured pig, and have them analyzed for their silicon and sulphur contents, also for carbon, if desired. While this work is progressing, I would arrange to have the samples forwarded to your office at Cleveland or Pittsburg, if allowable, and when received there, have a committee from the Cleveland Engineers' Club, or the Pittsburg Foundrymen's Association, as the case may be, meet Dr. Kirk and his experts, and record their opinions as to the grade of the samples then on hand. Still better, it might be arranged to have the samples at the coming convention of the American Foundrymen's Association, to give founders from all parts of this country a chance along with the doctor and his experts to demonstrate their ability in this line, if he would accept such a plan. If the Doctor or his experts fail to fairly define the silicon and sulphur contents of all the samples, and also carbon, if they wish (which two or three metalloids will fairly indicate the grade of any brand of iron), then the Doctor will pay the expense of colleting the samples and making the analyses, and the traveling expenses of his experts. But should the Doctor and his experts define the above chemical contents of all the samples, then I agree to pay the expenses to the extent of $200, which should be ample to cover the cost of such work.

It may be that Dr. Kirk has not sufficient interest in such a test to risk that amount of money for the sake of science. In this event, I would suggest that he appeal to the Philadelphia, Pittsburg and Chicago associations of founders to back him. My reason for putting the matter in this form is to give the Doctor no excuse to waive this question, for, if he is correct, it is to the interest of the whole foundry trade that his claim should be established in such a manner that it will go on record to assist in settling any future disputes on this subject.

Further down in Dr. Kirk's article he says: "There are many castings in existence today made many years ago for which the iron was chosen by fracture, that are in no way inferior to those made by chemical analysis and in many cases superior to them." If Dr. Kirk had ever managed for any length of time foundries that were guided wholly by fracture, in making mixtures, he would know that in obtaining those castings "in no way inferior to those made by chemical analysis," there were many that were so inferior that they went to the scrap pile or were very far from being what was desirable. His claim puts me in mind of a man who made a great demonstration over one that got rich by lottery but neglected to say a word about the poor fellows that lost.

Before I accepted chemical analysis as a guide, I claimed to be as good an expert in judging pig iron by fracture, etc., as any going, and can present several other points beside those given by the Doctor, for the benefit of any that think they can judge pig iron by its fracture. It is rather amusing to read the Doctor's praise of a few experts whom he sets up as examples of perfection. The trouble with all who pride themselves on being experts is that they never call attention to any errors they may have made and that if castings do not come out the grade they want, they honestly believe it was due to other causes than their judgment in selecting the pig iron. Then again, if they were satisfied that they had made a mistake, it is rare to find men priding themselves on being experts, admitting it. "Honest confession is good for the soul." I now know that I have often erred in making excuses for ill results in the past 20 years of foundry management, by trying to lay the blame on the fuel, getting wrong piles of pig or scrap, uneven charging, etc., when the trouble was due to the deceptive fracture of pig iron. It generally takes tact to get the truth out of an expert. As an example: Not long ago I happened to meet on the train an old experienced founder that was conceded by most all that knew him to be a "good one" in judging pig iron by the old school methods. During our conversation we turned to the subject of making mixtures and he wanted to know what I thought about the bosh on chemical analysis appearing from time to time in the trade papers, etc., claiming that it was a poor tool of a founder that could not tell pig iron by its fracture. I cut the matter short and turned the conversation to other subjects as quickly as possible. After a little steering, I got my man in a very confidential mood by making a confidant of him on "bulls" I had made, and gradually brought him around to discuss the reasons for getting hard iron out of a cupola when we had figured to get soft iron, etc. Before I got through with this subject, the man had disclosed such tales of woe, that could Dr. Kirk have heard them I am afraid his faith in fracture experts would have been so lowered as never again to rise. Before I left this founder he admitted his errors and said that as soon as he returned to his home he would study to work by analysis and try to get his firm to employ a chemist to analyze every car of pig iron that came to their yard.

Here was a man that had followed the old school methods for nearly 50 years, and because he and thousands of others have done the same, Dr. Kirk feels called upon to say as he does in this first paragraph: "Yet a practice that has been in vogue for so many years must have some merit." There would be as much reason in trying to apply this same statement to the present practice of blast furnaces, for have they not abandoned practices that were in vogue with them for a great many years? I would like the Doctor to name a blast furnace that would now abandon chemistry to return to the old school methods, thinking because they were in vogue for so many years they should have some merit; and also to state why it is not possible for the founder as well as others to have erred in past practices.

THOS. D. WEST.

Sharpsville, Pa., Feb. 19, 1900.

Smoke Prevention in Pittsburg.

A committee of the Pittsburg Chamber of Commerce, appointed some time ago to investigate ways and means of abolishing smoke, reported this week. The committee investigated the situation thoroughly and came to the conclusion that without the aid of the city authorities smoke could not be abated. The report states boldly that thus far no smoke preventing devices have been invented, but adds that there are a number of devices which if attached to boilers and intelligently used will greatly diminish the emission of smoke. It is pointed out that the undue urging of boilers is one of the principal reasons for the existence of the nuisance. This is especially true of the business portion of the city, where power plants are installed in cramped quarters and the boilers are too small for the service required. For this reason it is stated that no device will give satisfactory results under all conditions. Concerning smoke production by the great manufacturing plants, furnaces and mills about the city, it is noted that considerable improvement has been attained by providing ample steam generating capacity combined with the best mechanical stoking devices. Despite this agitation the authorities are face to face with a recent court decision in which smoke was declared to be an absolute necessity for the well being of Pittsburg, and the judge suggested that those who could not abide it had better go elsewhere.

IT is reported that the Damascus Steel Co., Pittsburg, manufacturers of tool steel, the Fulton Tool & Foundry Co., Canal Fulton, O., and the Crown Wire Co., Pittsburg, have purchased 60 acres of land in Parkersburg, W. Va., upon which they will shortly concentrate their plants.

THE WELLMAN LIFTING MAGNET.

The accompanying cuts represent one type of the Wellman lifting magnets for handling steel or iron plates, bars and slabs. These magnets are designed to suit any desired capacity and are so arranged that in handling a number of plates at one time the bottom plate can be dropped off without disturbing the others. The magnets quickly handle material to which it would be difficult expeditiously and securely to hitch an ordinary chain. A crane equipped with them thus often dispenses with three or four men who would otherwise be required, besides saving the time that would be occupied in blocking up a plate in order to pass the chain under and around it, or for prying up the plates for attaching the ordinary clamp. Where it is required to handle hot material, the manufacturers furnish special magnets provided with insulation that will withstand the high heat. The magnets can be made of any shape required by the material to be handled. That shown in the cut is best suited for handling plates or thin material where the magnet can come in contact with a fairly flat surface. All magnets are moisture proof and are thoroughly insulated so as to prevents grounds.

The amount of current required is very small. A representative of this paper witnessed the test shown in Fig. 2, a five-ton load of pig iron being lifted from the floor and suspended for half an hour, and only eight-tenths of an ampere was consumed. Objection has been raised to the use of these magnets on the ground that should the dynamo belt slip, or a circuit breaker fly open, the load would drop. On this point the manufacturers say that it is manifestly unsafe to to go under a load suspended by a crane of any type whatever, as the chain may break or the hook give way unexpectedly. However, the objection referred to can be overcome by installing the magnets on a storage battery circuit, or running an independent line direct to the generator without circuit breaker or fuse in the circuit, the wire required being so small that a short circuit can do no harm. If additional precaution is required, a chain can be attached to the magnet and swung around the article to be handled, the magnet being provided with suitable hooks for the purpose. The manufacturers state that the Wellman magnets have been in use for over three years without an accident. The magnets shown in the accompanying cuts are the same design as the largest commercial magnets in the world. They belong to a set of four shipped to Oesterreische Alpinen Montangesellschaft, Vienna, Austria. The Wellman lifting magnets are manufactured by the Electric Controller & Supply Co., 31 Michigan St., Cleveland.

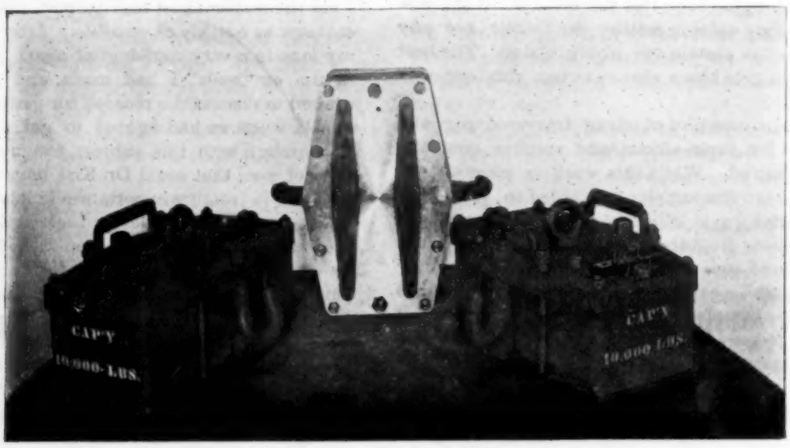


FIG. 1.—WELLMAN LIFTING MAGNETS.

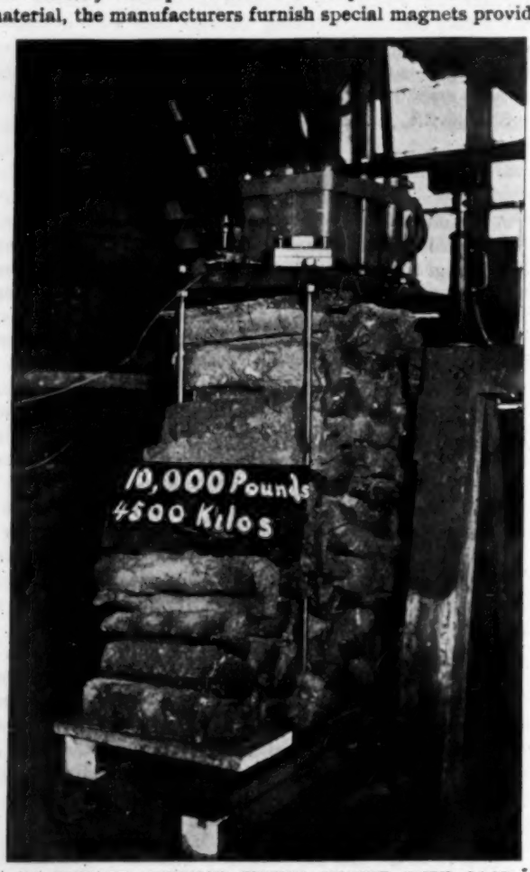


FIG. 2.—TEST OF WELLMAN FILTING MAGNET WITH LOAD OF 10,000 LBS OF PIG IRON.

CHARLES F. HOOD, of Connellsville, Pa., has patented a binder and the necessary machinery for the manufacture of briquettes from the coke cinder and fine breeze coke which havebeen piling up in this coke region for years. It is claimed for briquettes made by the new process that they will burn side by side in a furnace with a block of Connellsville coke and will last two-thirds longer and will burn from the outer circumference to the core, with no disintegration or breakage. One of the claims of the patentee is that there is not an ounce of pitch in the binder, there is no sign of smoke and the briquette is odorless. The cost of making the briquettes including the drying is put at 28 cents a ton.

THE Pennsylvania Co. has recently laid nickel steel rails on its famous horseshoe curve. The rails at this point have been subjected to severe service and as the nickel steel rail has greater resistance to wear than the ordinary steel rail it has been given a trial. If the results are satisfactory the nickel steel rail will be put in at other points along the line. While the Pennsylvania Co. has not purchased any iron rails for the past 19 years it still has a considerable tonnage in use on various lesser lines. These, however, are being rapidly displaced.

No. 1 of the two new furnaces of the National Steel Co., Youngstown, O., was blown in last week. The second furnace will be blown in in about 60 days.

THE CHEMIST IN THE FOUNDRY.

Dr. Kirk in Reply to Mr. West.

TO THE EDITOR:

Mr. Thomas D. West evidently belongs to the old school of founders, who believe the cupola to be a mysterious foundry apparatus, that no one knows anything about, but the old professional melter. In his criticism of my paper, published in *The Iron Trade Review* of Jan. 25, he says: "To understand the hundred and one things that can change the grade of iron after it is charged into a cupola, put through the process of melting, and at last poured into the mold, generally requires a long experience as a founder." In your issue of Feb. 8 he says: "Dr. Kirk is too good a cupola manager not to know that changes in the character of fuel, pressure of blast, height of beds, weight of charges, blast stoppage, and uneven charging of the fuel, iron, etc., can be made effective in changing the character of final results in mixtures, etc."

This is ancient cupola practice to perfection, and founders will readily recognize it as such, as almost all of them have heard these excuses made for poor melting hundreds of times. This everlasting excuse-making for bad results is what the founder as well as the furnaceman wants to get rid of. There are no doubt many things that change the character of iron when melted in the cupola. But there is nothing, absolutely nothing, that changes the character of an iron in a cupola other than the ordinary changes that take place when iron is reduced to a fluid state and returned to a solid, that cannot be controlled by a thoroughly competent melter. The same grade of iron, melted in the same cupola, with the same quality of fuel, produces exactly the same quality of iron at the spout throughout a heat; and the same quality one day as it does another, when a cupola is properly managed.

Mr. West has only to visit some of our leading stove foundries to learn that this is not theory, but a fact that is demonstrated every day a heat is melted. In these foundies heats of many tons are melted without a perceptible difference in the temperature of the iron, from the beginning to the end of the heat; or in the heat of one day from that of another; and no change in the quality of iron other than that which always takes place when iron is melted. The mismanagement of cupolas has been the bane of blast furnacemen ever since the cupola was first placed in a foundry. Thousands of tons of good iron have been condemned and thrown back on the furnaceman's hands as inferior irons to be sold at a sacrifice, simply because the melter was not competent to manage the cupola. Thousands, and I may say millions of dollars have been lost to furnacemen and founders of this country by the bad management of cupolas.

Men are placed in full charge of cupolas, who have no knowledge of the science or art of managing them, and cupolas are chipped out and daubed up without any regard to a proper shape being given to the lining. Bottoms are not given a proper slope; fires are not evenly burned; too great an amount of fuel is placed in the bed; iron is melted too high; fuel is charged on one side of the cupola and iron on the other; irons are not properly mixed in charging, are not melted of an even temperature throughout a heat nor of the same temperature two heats in a week. This kind of cupola management of course does not produce an even grade of iron or as good an iron at the spout as went into the cupola. The best of iron may be ruined when melted in this haphazard way. I have seen a mixture of the best brands of Scotch pig and No. 1 Pennsylvania irons run hard in stove plate when melted in this way, and the same irons run too soft and kishy for plate when properly melted. The cupola in which this iron was melted was not properly managed and charged, did not melt an iron of an even temperature or an even stream of iron, and four hours were required to melt the heat. When properly managed and charged it melted iron of an even temperature, and an even stream of iron and a heat of the same size was melted in one hour and a half without any change in the construction of the cupola, tuyeres, pipes or blowers.

This showed conclusively that the hard iron was due entirely to mismanagement of the cupola. Of what benefit would a furnace analysis of these irons have been to the founder? None at all; and the case would have been set down as one of those referred to by Mr. West, and also by Mr. Whitney, in which the blast furnace analysis could not be depended upon and the iron condemned. Of what benefit would the foundry chemist be, who could only make anlayses, have been to the founder? None at all. And he would probably have found his laboratory closed and his services dispensed with. On the other hand, had he been a practical cupola man, as well as a chemist, he could have produced a soft iron at the spout in place of a hard one and his position would have been secure.

Mr. West may say that the founder was at fault; that he should have looked after the cupola himself. This founder was not a practical cupola man. Few founders are practical in every detail of their business. Almost every one of them has to depend upon employes in the management of some branch, and this one had to depend upon his melter, for his foundry foreman, like nine-tenths of foremen, knew nothing about a cupola. He employed an experienced melter, having as high a reputation in that work as any man in a foundry district in which there were at least fifty foundries within a radius of 10 miles. This man had done good melting, but had gotten off the track, and, as melters frequently do, when he could not make the cupola melt satisfactorily, he fell to making excuses for his failures. The founder was bound to accept them for he had no means of learning the real cause of the trouble.

Many founders now are in exactly the same position in regard to the management of their cupolas. Only today, while conversing with a molder, I learned that two heavy hydraulic cylinders, weighing a number of tons each, and cast in dry sand molds, had been condemned and returned to the foundry at which he was employed, because spots had been found in the flanges so hard that they could not be turned or planed These hard spots could not have been caused by a dry sand mold, thoroughly dried as these molds were, and the loss of these castings, as can plainly be seen by any practical cupola man, was purely a case of bad cupola management. Upon inquiry, I heard they were having a great deal of trouble with their cupola—slow melting, iron of an uneven temperature, etc. With iron from a cupola of the latest improved pattern, put in within the past six months, of what value would an analysis have been? It is purely a case of improper mixing and melting of iron, entirely beyond the reach of analysis.

I am a believer in the improvement of cupola management, and the chemist, if employed at a foundry, is the man to make this improvement. A cupola is not the mystery many suppose it to be, and a life time is not required to learn how to run it. Any practical man may learn to manage a cupola in one week's time under proper instruction. I know this to be a fact, for I have taught many foundry foremen to manage the cupola of their foundry in this length of time, so that they were able to obtain better results than the melter, who had been running it for years without any idea of the principles upon which a cupola should be managed. In my recently published work, "The Cupola Furnace," I endeavored to describe fully these principles and also to enumerate the causes of failures. A careful study of these principles by a practical founder or foreman should enable him, with a little practice, to manage a cupola and to overcome many of the bad results in melting for which various causes are assigned by poor melters.

EDWARD KIRK.

Philadelphia, Feb. 12, 1900.

THE American Machinery & Trading Co., whose main office is in the Bowling Green Bldg., New York, announces that it is prepared to furnish all lines of equipment required in factories, mills, electric and power plants, and to bid on specifications in these lines. The company will also accept agencies from manufacturers for the sale of machinery in foreign countries. Branch offices are maintained in Chicago, Boston, Pittsburg, Philadelphia, Atlanta, St. Louis, San Francisco, Montreal, and in London, Paris, Berlin, St. Petersburg and Sydney.

The Wilkes Rolling Mill Co., Sharon, Pa., has awarded the contract for machinery for a 24-inch sheet mill to the Totten & Hogg Iron & Steel Foundry Co., Pittsburg. Work on the erection of the mill will be commenced immediately.

STILWELL CAST IRON FEED WATER HEATER.

The Stilwell-Bierce & Smith-Vaile Co., of Dayton, O., has improved its all-cast-iron feed-water heater, and it is now manufactured after the construction shown in the accompanying cuts. The corroding effect of acids or salts upon wrought iron or steel have shown the advantage of a heater made entirely of cast iron. In Fig. 2 a sectional view is given which gives a good idea of the design and operation of this heater. The incoming exhaust steam impinges upon the conical deflecting plate, which is provided with grooves, and which separates the cylinder oil, carrying it to sides and bottom of the chamber to the opening marked "oil discharge." This deflecting plate also carries the steam downward, as indicated by the arrows, to the two rectangular openings through which the steam passes into the heating chamber. The construction of the receiving chamber is such as to prevent shock and breathing of the heater, which would result from admitting the exhaust from high pressure engines direct into the heating chamber.

Steam is admitted to the heating chamber from the receiving chamber through two rectangular openings, which extend nearly across the plate that separates the two chambers. Two long continuous streams of steam are thus directed into the body of water which is falling constantly in thin sheets over the edges of the oval-shaped pans, thus presenting conditions facilitating the transfer of the heat in the steam to the water. The uncondensed steam escapes freely from the top of the heater, and the construction is such as to prevent carrying water out with the escape steam. The lower portion of this heating chamber is a reservoir of large capacity filled with hot water. It also servs as a settling chamber and a receptacle for the condensation returned from radiators or heating coils used on the premises. This chamber is provided with two floats, one for regulating the inflow of feed-water and one for regulating the over-flow, thus affording a double safeguard against flooding the heater. The filtering chamber filters upward, thereby retaining any soft material at the bottom of the heater, where it can be blown off. The chamber for filtered water contains a large supply of hot filtered water, from which the boiler feed-pump draws its supply. Quick and easy access is given through large doors and hand-holes to every part of the heater.

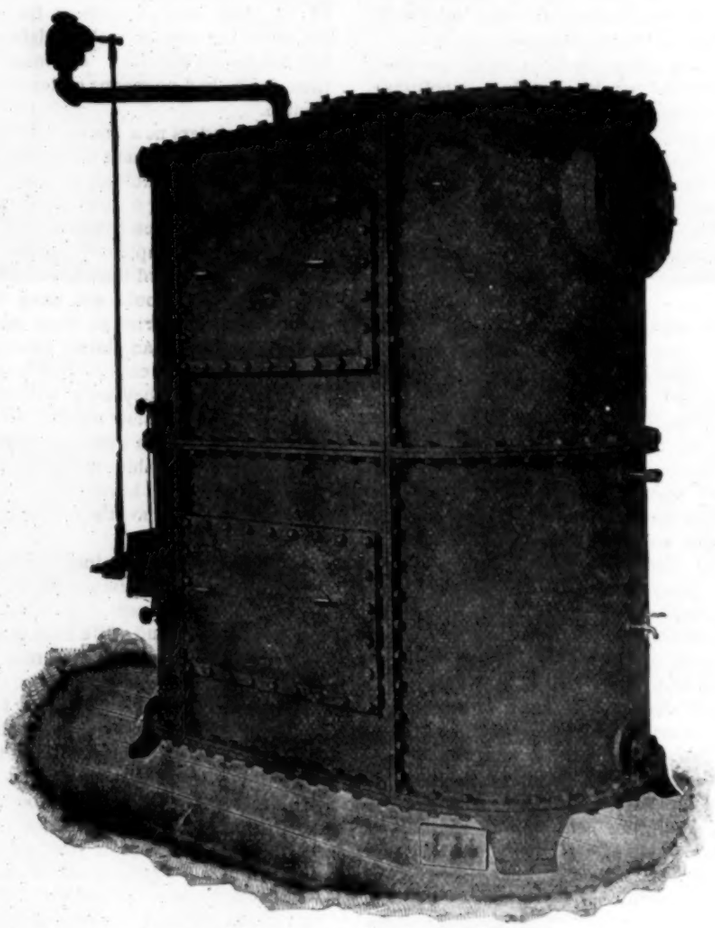


FIG. 1.—STILWELL CAST IRON FEED-WATER HEATER.

Great Records by Lake Ore Carriers.

In the statistics of the Sault Ste. Marie canal for 1899 the following are given as cargo records of some of the largest vessels carrying iron ore: Steamer Malietoa, owned by Pikands, Mather & Co., of Cleveland, moved 8,215 net tons in a single cargo; steel tow barge John Smeaton, owned by Bessemer Steamship Co., moved 8,339 net tons in a single cargo; steamer Presque Isle, controlled in the office of the Cleveland-Cliffs Iron Co., Cleveland, moved through the canals during the season 187,816 net tons; steamer Andrew Carnegie, owned by the Wilson Transit Co., Cleveland, covered 42,027 miles during the season; steamer H. W. Oliver, owned by the Wilson Transit Co., of Cleveland, had 141,475,588 mile-tons to her credit for the season.

Ten steel vessels of the largest kind had average cargoes throughout the season of 7,385 net tons; 18 averaged 6,423 tons; 19 averaged 5,420; 13 averaged 4,525; 114 averaged 3,404; 74 averaged 2,511. Of the tow barges four averaged 8,179 net tons; nine averaged 6,404; 13 averaged 5,790; nine averaged 4,445; 25 averaged 3,552; and 35 averaged 2,309. The report also shows that 344 vessels using the canals are capable of carrying collectively in a single trip 1,308,603 net tons of freight. Forty-one vessels using the canals were of 400 to 500 feet length, 126 of 300 to 400 feet, 267 of 200 to 300 feet, 289 of 100 to 200 feet, 109 of 10 feet and less.

READE & BOWLER, Cleveland, dealers in second hand machinery, have opened a branch office in the Park Bldg., Pittsburg.

The rolling mill of the Ohio Iron Co., Zanesville, O., recently purchased by S. R. Wells, of Greenfield, Ind., for $32,500, has started again.

CARBON AND SILICON IN CAST IRON.

In No. 2 of the *Journal* of the Iron and Steel Institute for 1899, recently issued, is an interesting contribution by Bertrand S. Summers, of Chicago. Though it is a continuation of the discussion of Mr. Summers's paper "Theories and Facts Relating to Cast Iron and Steel" presented before the Iron and Steel Institute at its annual meeting last year, it raises points of general interest:

"Replying to Mr. Stead's excellent discussion, the writer can most heartily agree with him upon most of the points. It is with pleasure that Mr. Stead's familiarity with graphitic temper carbon is noted. The author must confess his ignorance on this subject, as he is only familiar with temper carbon through theoretical consideration. He has many times endeavored to isolate the temper carbon, but up to the present time has failed. Mr. Stead's criticism of denominating temper carbon, 'carbon in a transition state towards graphite,' is very probably legitimate; his better knowledge on the subject, however, would at least prevail. It is noted with interest that the temper carbon may be made to appear by dissolving the metal in nitric acid, and treating the residue wtih hydro-fluoric acid. The assumption that temper carbon is able to raise the permeability in cupola metals seems legitimate, in which contention Mr. Stead agrees.

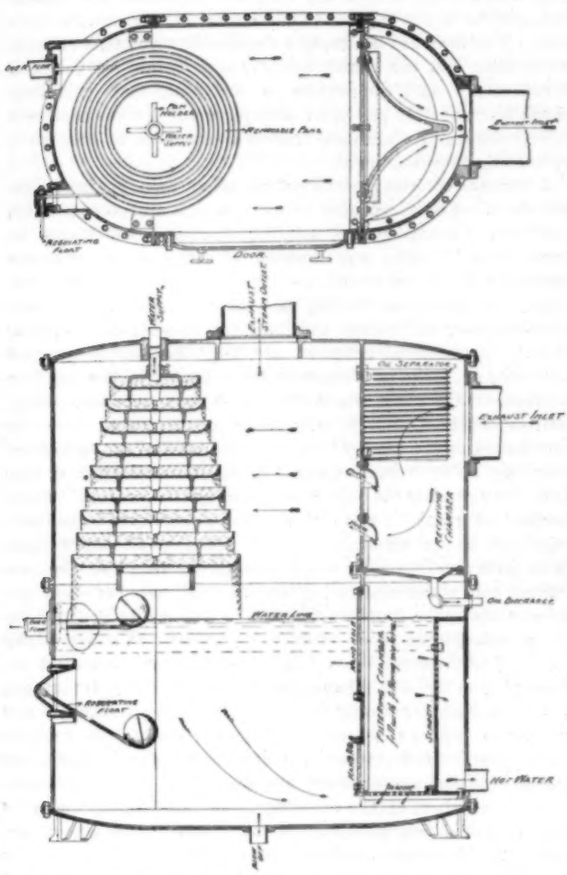


FIG. 2.—SECTIONAL VIEW OF STILWELL FEED-WATER HEATER.

"The author regrets that he cannot agree with Mr. Stead's contention that ferro-silicon iron enables a cupola mixture to carry more scrap, as it is contrary to his experience. It is possible, however, that the condition of the scrap, as Mr. Stead suggests, may account for this difference in experience. The scrap mentioned in the paper was a very fair grade of scrap iron; it was, however, principally from light work. It is the author's experience, where the silicon content of the mixture is higher, the iron is more open. This may be due, as suggested in the paper, to a difference in proportions to temper and graphitic carbon. Mr. Stead is quite right in assuming that three and three-tenths per cent of carbon is above the danger limit mentioned, and as Mr. Stead suggests, in using scrap of this carbon content there is little danger of reducing the carbon below the danger limit.

"Mr. Stead's remarks relative to the effect of phosphorus introduces a very interesting phase of the question. Within the past year the author has been using a southern charcoal iron with a content of phosphorus of two per cent. The composition of this iron is rather anomalous. Frequently we have had difficulty in finding anything but a trace of combined carbon in the pig iron as it comes from the furnace. The combined carbon is usually less than one-tenth of one per cent, although the total carbon content is in the neighborhood of three per cent. Below will be found a few analyses of this iron:

ANALYSIS OF MANNIE PIG IRON.

	Per Cent.	Per Cent.	Per Cent.
Silicon	3.84	3.70	3.77
Sulphur	0.003	0.005	0.016
Phosphorus	2.02	2.15	1.84
Manganese	0.34	0.57	0.33
Graphite	2.82	2.67 by HCl 2.83 by HNO_3	3.11 by HNO_3 3.10 by HNO_3
Total Carbon	2.92	2.83	2.93 by HCl 3.08 by HCl 3.08 by HCl

"To be sure, the iron is high in silicon, but the author has had experience with many irons where the composition was about the same excepting the phosphorus, which was low in every case. About two to three-tenths of one per cent of combined carbon was found at a minimum. Without making any positive statement, it would seem that the peculiar nature of this iron is somewhat traceable to phosphorus. The author's experience would tend to confirm that of Mr. Stead in the statement that increasing the phosphorus content tends to lower that of the total carbon. There is certainly room in this phase of the question for investigation, and the publication of Mr. Stead's researches on this point may be looked forward to with interest.

"There remains but one point further to discuss, which is that of the combination of manganese in iron and steel. The question arises whether the manganese is combined with the iron, carbon, or both. Mr. Stead's citation of the fact that carbon and iron alloyed together do not make a metal suitable for permanent magnets is a very good argument against the combination of carbon and manganese alone. The author remembers having seen somewhere in the back proceedings of the French Academy mention of the isolation of carbides of manganese, and it may be that some of these compounds have their influence, or it may be, as Mr. Stead says, a combination of the three elements mentioned here. The conclusion of Mr. Hadfield, that manganese is either combined with carbon, or a double carbide of iron and manganese, seems to be legitimate, in which Mr. Stead agrees."

THE strike of the rod mill workers in Cleveland and other mills of the American Steel & Wire Co. was officially declared off on Feb. 16 by President Jones of the Rod Mill Workers' Association. This action was taken, the officials of the union say, on account of the stand that was taken by the boss rollers. The seven boss rollers employed in the different mills of the company in Cleveland started one of the Newburg mills recently and took the places of the strikers. One week preceding the termination of the strike the officers met and decided to continue it and they state that the voting in the lodges showed six out of seven in favor of staying out. But the matter was finally left to the decision of President Jones, who declared the strike ended.

THE general offices of the American Tin Plate Co. will be removed from Chicago to the Battery Park Bldg, New York City, on Feb. 26. As has been announced heretofore the National Steel Co.'s offices will also be removed from Chicago to the same New York building. It will also be the home of the American Steel Hoop Co., which now has general offices in Pittsburg.

The old Weston charcoal furnace at Manistique, Mich., is to be started again, with W. H. Nelson, formerly of the Excelsior furnace at Ishpeming, Mich., in charge.

METHODS OF MARKETING PIG IRON.*

BY GEO. H. HULL.

Each decade in the history of pig iron consumption in the United States marks an enormous increase. This increase does not come with regularity; on the contrary, it presents a succession of long periods, covering several years, when the consumption remains about the same, with prices ruling so low that many furnaces are forced out of blast and into the hands of the sheriff. This is followed by short periods of a few months, when the consumption increases from 50 to 100 per cent. In these seasons of great consumptive activity, it is impossible to increase the output to meet the demands. There is a famine in all iron and steel products, which cause expensive delays in important enterprises. Prices advance to enormous figures; many concerns which have large contracts and small stocks, find themselves actually paying more for their raw material than they are to get for the finished product. They hardly get their business shaped up to meet the new conditions, before prices go tumbling down again, spreading loss and disaster on every side, to be followed by another long period of depression.

Iron is so thoroughly the basis of all industries, that what affects it must affect all manufacturing business. The question, therefore, which most concerns every consumer of pig iron, is, what system will insure the greatest regularity in supply, with most stability in price? And ideal system to fit such conditions, would be the existence of some group of individuals, with vast wealth, who would come forward and buy from the producers, for cash, at fair prices, all the surplus iron made during the several years of small consumption, and then in turn, during the recurring seasons of great manufacturing activity, resell it to the consumers. Which system most nearly resembles this ideal?

German Syndicate System.

The pig iron business of Germany is conducted by a syndicate or association of the individual producers. The leading idea of its organizers was to do away with needless and ruinous competition among themselves. At the time of its formation, it was made quite clear, that the organization did not wish, or intend, to enhance prices to the consumers in an oppressive way. At the beginning, each member was required to file a statement of his or their production for a number of years, and the average annual production of each, as thus shown, was made the basis of the percentage of production allowed to each company from time to time. When the demand for iron falls off, the total production of the furnaces is cut down accordingly; when the demand increases, the total poduction, as far as the capacity of the furnaces permits, is increased to conform to the greater demand. As it is not always practical for each company to cut down production to meet the arbitrary percentage ordered, the difficulty is met by a payment, by the syndicate, to the furnace company which makes less than its allotment, and by a corresponding collection from the furnace company, which makes more than its allotment. In order to keep the respective parties to their agreements, each individual or company, on being admitted to membership, is required to deposit with the syndicate bank, an accepted sight bill for a certain amount, with the condition that said sight bill is to be forfeited to the syndicate, if the conditions of the agreement are violated by the member depositing it. The syndicate has one office. All inquiries for iron from consumers and dealers must be addressed to this office, and no member is allowed to sell, except through this channel. The syndicate purchases all supplies for its members; it fixes the prices for the different qualities of iron from time to time; it will sell for delivery six or 12 months ahead, or longer, to meet special requirements.

The system has resulted in a large reduction in the expense of selling iron, and in a very considerable saving in the purchasing of supplies. It has entirely done away with ruinous competition, and has maintained prices which have been fairly remunerative to the producers. There are objections to the system. It puts all the power in the hands of the producers, a power which is at any time liable to be abused. It is artificial. It is not the result of free and untrammelled operation of natural laws. It is a forced condition, held together by an agreement which is maintained by the fear of forfeits and penalties.

History does not furnish a single example of any business system, formed and maintained by such methods, which has endured. The serious defect of the system lies in the fact that it not only lacks a method of accumulating and carrying a reserve stock in dull times, but its chief object is to prevent such an accumulation. A system which restricts the production of the article most necessary to the growth of the country in wealth and power, is arrayed against the public good, and should be prohibited by national law.

British Warrant System.

The British warrant system originated in Scotland about the year 1840, though no statistics of same have been preserved farther back than 1845. Briefly stated, the warrant system is to the pig iron business, what the elevator system is to the grain business, and what the public warehouse system is to the cotton business. The functions of a warrant company are few and simple; it receives into its yards pig iron, which it has previously weighed, inspected and classified, and for which it gives to the owner of the iron, a warrant. This warrant is simply a negotiable warehouse receipt, which describes the brand, quality, and weight of the iron it represents and guarantees or warrants, that on return of the warrant duly endorsed, and payment of storage, it will deliver the iron it describes, free on board cars, to the party presenting said document.

A warrant company performs no other acts or functions, but the effect of these acts, is to create a document, which the furnace company can sell for cash, and which can be transferred by sale, any number of times, each purchaser becoming the owner of the iron, by the transfer of the document, each purchaser having the right to re-sell the warrant, or to cancel it and obtain the iron for export, consumption, or any other desired purpose. At first, the Scotch warrant consisted of scrip, or storage receipts, issued by the pig iron makers, for the convenience of dealers, but so many irregularities occurred, that it was found necessary to have the iron stored in the yards of an independent firm of undoubted standing. The firm of Connal & Co., now Connal & Co., Ltd., inaugurated the system of issuing the present "storekeeper's warrant." For 50 years these warrants have been regarded as an absolute security. Money is loaned upon them with confidence by every bank in the kingdom, the prevailing rate of interest being one-half of one per cent. per annum above the Bank of England rates, which is a rate enjoyed only by the most favored collateral. The semi-daily dealings in these warrants is the prominent feature on the floor of the Royal Exchange of Glasgow. The warrants are bought and sold, not only by the iron producer, consumer, and merchant, but by the general public; it is, in fact, the favorite security among all classes who buy and sell for a profit, and the dealings in consequence are enormous; there are more than 70 members of the exchange who make a specialty of buying and selling warrants for the public. The wheat certificate is the only security in the United States, which in popularity, approaches the popularity of the pig iron warrant in Great Britain.

The statistics of the Scotch warrant system show that the average reserve stock of iron carried by that method during the last 50 years, has been more than six months' production; for one period of five years, it was more than 12 months' production. There have been six periods of accumulation and six periods of depletion of stock, and three times these large reserve stocks have been reduced to less than 100,000 tons. This is evidence that the seasons of accumulation were not seasons of over production, since each accumulation was afterwards almost entirely exhausted by the legitimate business demands of the country. It is no more over-production to make and store up enough iron in seven years of dullness, to supply the business of the country through two years of activity, than it is to raise and store up in a few weeks of harvest, enough grain to supply the country during 12 months of consumption; it simply requires a broader mind to take in the proposition.

Great Britain has been the country to which for a century,

* Extracts from a paper read before the Philadelphia, Pittsburg and other Foundrymen's Associations, February 7, 1900.

all the world has looked for everything connected with iron. An English contractor will undertake a contract in a foreign country, which requires 50,000 tons of iron and five years to complete, as readily as an American contractor will take one which can be completed in a few months, simply because he can protect himself against fluctuations in price of iron and steel, through the warrant system. When such a contract is taken by the English contractor, he immediately closes a contract with his exchange dealer for warrants covering 50,000 tons, at the market price, which the dealer agrees to carry at two cents per ton per month storage and a low rate of interest, perhaps one and one-half per cent per annum. It may be a year before the contractor is ready to give an order for the first 10,000 tons of steel to be used in his work; when he gives the order, he sells an equal tonnage of his warrants. If the price of steel has advanced, the warrant iron has advanced; if iron has declined, he buys his stee at a corresponding decline; he is thus protected on each order he places for steel during the five years. By this means he eliminates all risk of fluctuations and confines his business to its legitimate profits.

The warrant system has no disadvantages, and no just argument can be made against it. There is no good thing, however, which cannot be misused. Some people have tried to corner the warrant market, and, as usual, been badly crippled in the attempt. These victims of their own folly have made an outcry against it, and made an effort to have the system abolished by Parliament. They were like the few frogs in the pond, which made so much noise it was thought there were a million but when the round-up took place, they discovered the three loneliest men who ever arrayed themselves against a nation. It would be just as reasonable to ask Parliament to abolish razors, because a few people have been known to cut their throats with them. The effect of these corners upon those who were engaged in the legitimate business of producing, consuming or dealing, was simply to give them an opportunity of unloading all their surplus on the ring, at high prices, while the corner lasted, to be bought back the next month at a handsome profit.

The legitimate price of a staple must and always will assert itself, by and through the actual business doing in that staple. Speculative interference has had, and can have, only a temporary influence. An argument used against the system by some of its opponents, is that it creates a collateral on which producers can easily borrow money from banks, and that parties have sometimes so borrowed, and have increased and continued so borrowing on their product until they were ruined. This argument is characterized by such intellectual depth and penetration, that the only remedy we can suggest is that Parliament be asked to abolish banks at the same time it does razors. It is of course a folly for any producer to pile up his product, and carry it for several years with interest and storage charges accumulating against it, for unless it advances enormously at the end, it is likely to terminate disastrously. The dealer, however, under modern exchange methods, may carry iron under these conditions, and make a handsome annual profit in so doing.

The opinions of prominent men in England and Scotland who have been identified with the iron business for a generation, can be summarized as follows: The warrant system works beneficially in every respect, to both the producer and consumer. Through it the maker, even in dull times, finds a ready market for that portion of his product which is not taken promptly by the consumer or dealer. Through it the consumer is brought, in effect, face to face with every seller, be he producer, dealer, or investor, and is thus able to buy to the best possible advantage. The producer who anticipates a decline, may sell his product for months or years ahead, take out warrants for it as made, and collect cash for his warrants as presented. The consumer, if he anticipates an advance, may provide for his requirements for months or years ahead, with certainty that the iron will be delivered to him immediately on presentation of his warrant. It has all the advantages of the syndicate system, without its disadvantages, and at the same time, allows free scope to individual opinion and enterprise. It is in fact a balance wheel to the whole trade. The system is not forced or artificial. It is of natural growth, built up by the free and untrammeled working of all the elements, through an experience of centuries. Neither party controls it. It does not tie the hands of any element. It is not maintained by any agreements which must be held together by forfeits and penalties. It has nurtured a body of strong, vigorous, self-sustaining producers and consumers. Its existence and growth has depended on its usefulness to the producer and consumer alike, and its continued existence for 60 years without change, while constant changes have taken place in the systems of other countries, it is the best evidence that it meets the requirements of all the interests connected with the iron business.

Above all, it is an effective means, and the only means, through which large reserve stocks can be accumulated, without depressing prices. It is, in short, a working out, on sound and natural business principals, of the "ideal system," pictured in the opening of this paper.

American Method of Selling Iron.

The pig iron business of the United States has been of such sudden growth, that it has not had time to crystallize into a system. The methods of today are simply what changing conditions and necessities have made them. In 1840 the total production was but 290,000 tons; at that time the iron was sold by furnace companies. Twenty years later it had only increased to 820,000 tons and was still sold largely by the producer, but in the interim, through various causes, such as needy producers being obliged in dull times to pledge their iron for advances in money or supplies, the trade in the large cities had drifted partly into the hands of wholesale dealers in merchandise. The iron so pledged was first shipped from the furnace to the merchant, who hauled to yard and stored it, which necessitated a second hauling and shipment when it was finally sold to the consumers. This double handling added greatly to the expense, and the merchant having other business, gave only incidental attention to selling iron. The selling business being only half done, was poorly done.

Later on, the merchant's portion of the business went over to the commission men, in consequence of the latter being able to give their whole attention to selling, but it was not until the commission agents abadoned the system of double handling, and inaugurated the system of making sales, to be filled by shipment directly from the furnace to the consumer, that the makers gave up selling it themselves, and turned the business over entirely to the commission agents When this method became general, the makers had agents in each important distributing center, and confined these agents to the territory most easily reached from such center. The number of agents was small and each one represented several different brands. Under this method the competition was greatly reduced, and was much less destructive to profits than when the makers sold part of their own output. There were at this period some 600 producers, and yet the competition was confined from two to half a dozen agents in each territory. Later on, when the agents became stronger financially, and were able to aid their principals, these stronger concerns secured exclusive agencies, with authority to sell in all territories; this increased the competition greatly, as each territory was invaded by the agents from several other territories; the gents were compelled to employ many traveling salesmen in order to cover the larger fields, thus their own expenses were increased to such a degree, that their business yielded but little profit. This has resulted in the agents taking on other staples, such as coal, coke and the manufactured products of iron and steel, and more recently in becoming buyers and sellers on their own account, as well as becoming interested as producers.

In some important markets like Pittsburg, the iron commission agents have already disappeared and been replaced by the dealers. By these changes, the American methods, are gradually working more nearly to the British system, under which the iron is handled principally by dealers, and it is a notable fact that the largest increase in business among iron sellers in this country, has been with those who have been the largest buyers of warrants and iron on their own account; the fact of having something of their own, on which they could make instant quotation, giving them a great advantage over those who must consult a principal. A business must have some independence to insure its growth and permanence; the commission iron business, which is necessarily dependent on both buyers and sellers, has no independence,

and is always hampered. During all these changes in the American methods, many efforts have been made to form associations in the United States, similar to the German syndicate system, but what has been practical in a country of 212,000 square miles, where the interests of all producers were similar, has been impossible in a country of 3,600,000 square miles, where the interests of the producers were so conflicting and varied. At the present time such associations or syndicates are prohibited by United States law.

Thus for 60 years, through constant changes, the American producer has been struggling for some satisfactory method of marketing his product, and if, during that 60 years, there has been one producer and one consumer who has been satisfied with the methods in vogue, he has failed to make himself known to the world. We hear of furnace companies building works to consume their product, because they cannot sell it to advantage, and we hear of consumers building furnaces to make their pig iron, because they cannot buy it to advantage, but we hear of no one who is satisfied with conditions as they are.

The methods in vogue have given to the American iron business only the experience of constant suffering; seven years when the makers are suffering for buyers, and two years when the consumers are suffering for sellers. During all this time the iron business of Great Britain has been conducted under one system, and during 10 years of correspondence with, and a month spent among the iron men of that country, we have never encountered one, who did not consider their system a benefit to both producers and consumers.

Twenty-Four-Hour Coke.

The Connellsville *Courier* has the following: "The papers of the country have had considerable to say concerning the making 24-hour coke in the Connellsville region. The newspapers now seem to think that the region has found something new, and that since the coke can be made in 24 hours instead of 48 hours, thereby the production of the Connellsville region will simply be doubled. Such is not the case. To begin with, 24-hour coke was made in times past and successfully. But the companies do not intend to make 24-hour coke. That which was made recently was only spasmodical, and brought about by conditions over which the operators had no control. Workmen have been scarce during the winter in this region. During the cold weather, the coke drawers, whose places cannot be taken just as a ditch digger's pick can be taken hold of by a newcomer, became rather independent and some refused to go out upon the yards, feigning sickness or weariness. The result was that at many plants as many as 25 ovens in a block could not be drawn some days, and the working time became deranged. It is impossible to operate a block of ovens some of which are deranged out of their regular turn, as ignition is produced in the bee-hive oven by contageous heat. On this account at some of the ovens throughout the region 24-hour coke was made to get the ovens all back into their proper working order. The coke was burned just as hard and clean, however, because very light charges were put in. Even if 24-hour coke were made all over the region it could be done only by light charging, so that production would not be doubled or any thing near doubled."

THE work of dismantling the Johnson tin mill, New Castle Pa., was commenced last week. The plant consists of six mills adapted to the manufacture of black plate, and two mills adapted to the rolling of sheets. The plant was originally put in operation in 1873 for the manufacture of boiler plates and sheet iron. A few years ago the old plate mills were torn out and the plant was equipped for the manufactuer of black plates. During the early part of last summer, work in the mill was stopped and when the New Castle mills were purchased by the American Tin Plate Co, the Johnson plant was included. The plant was subsequently abandoned. It is stated that the two sheet mills will be moved to the Shenango plant and the six black plate mills will be moved to Indiana. The razing of the plant will leave vacant an excellent manufacturing site and it is said that a blast furnace will be erected on the site of the old plant. It is probable that the Red Jacket furnace will be moved to the Johnson mill site and another furnace erected adjoining it. The National Steel Co. would have two furnaces adjoining its steel plant if this is done, and the hot metal could be taken directly to the converting mill.

BESLY BAND GRINDER.

The illustration shows the Besly band grinding machine, which consists of pedestal, countershaft and spindles to hold either one or two emery band polishing wheels. These wheels are made of cast iron. An elastic surface is produced by felt covering. The emery or other abrasive material is a piece of emery cloth which is tightened firmly around the wheel. To reset the wheel, or change the grade of emery, it is necessary only to remove a band and replace it with another, an operation requiring but a minute. One of these wheels will take the place and do the work of a large number of polishing wheels. This machine is suitable for shop where skilled polishers are not employed. An ordinary shop boy with a little practice, it is said, can do the work of a skilled polisher. The diameter of the wheel is 12 inches and the width of face 2½ inches. These band grinders are made in various combinations. The No. C 20 consists of a single band wheel, mounted on a pedestal. The No. 20 D machine has pedestal and countershaft, with spindle as shown in the cut. On this machine a band wheel may be used

BESLY BAND GRINDER.

at one end of the spindle and the regular buff or an emery wheel at the opposite end. The machine is also made as shown in the cut except with band wheels at each end of the spindle.

IT is again rumored that the chain consolidation, which has been in the process of formation for several months, will be consummated within the next week or 10 days. The combine is to be known as the Standard Chain Co., and a charter has already been granted in New Jersey. The capital is $3,000,000. Options were recently taken that extended to Feb. 13. Should the deal be made it is said that the headquarters will be at Pittsburg. Two Pittsburg plants will probably be included—the Baker Chain & Wagon Iron Mfg. Co. and the Garland Chain Co. The plant of James McKay & Co. and the chain department of Jones & Laughlins, Ltd., will remain as they are. It is said that either Robert or John W. Garland will be elected president.

Officers of the Republic Iron & Steel Co. have been in the Birmingham, Ala., district arranging for the erection of the third Thomas furnace, plans for which were made some time ago.

NATIONAL ADJUSTABLE OPENING DIE STOCK.

What is regarded by its makers as an improvement upon the opening die stock of Stockwell is now manufactured by the National Die Stock Co., of Cleveland, under patents of November, 1899. The well known form of cutters and dies are retained, but they are presented in an adjustable opening die, equally rigid, yet simpler and more easily handled. The dies are as quickly changed as a solid die, it is claimed, and they cannot but center, as the plate will not go on wrong, and the cams control the dies on center, this being the special feature of the improvement. The operator is able, if the work is too hard, to cut a light thread before finishing with a full thread, and this without backing off or losing the

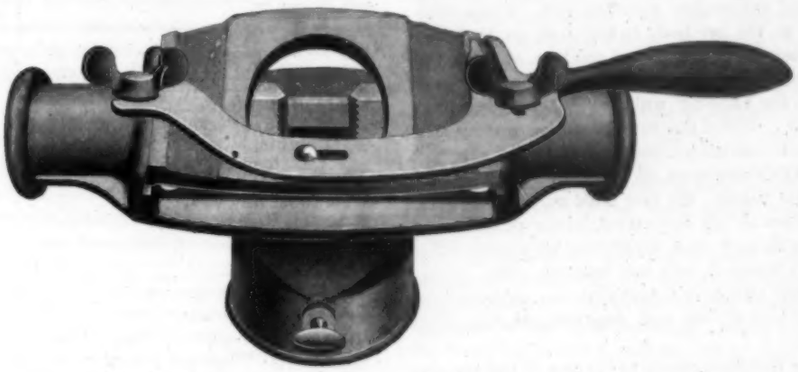


FIG. 1.—NATIONAL ADJUSTABLE DIE STOCK.

thread. An operator is thus able to handle large pipe, otherwise beyond his strength.

The two inclines or cams on the movable cover or cam-plate travel through and over the dies at a slight angle, compelling them to move on their straight ways to center. The cams thus bear most of the strain of cutting, while the plate itself is firmly held at the desired place on the stock. This is done either by a thumb-screw on top or a bevel clamp operated by a thumb screw on the under side. Fig. 1 shows the stock with plate held by a thumb screw on the handle. The wedge cam is preferred, however, by the manufacturers. In Fig. 2 are shown all the parts of a 2-inch die stock with one die on the ways and the other ready to be dropped on. The back-wedge has the light duty of drawing back the die when released. The cams on the plate travel on the bottom of the slot and receive the pressure of cutting on their inner side. The stock being open below the dies allows of cuttings falling away, and of being easily cleaned and freed from them. A space is left beyond the travel of the dies for chips or dirt to work off. The dies otherwise keep themselves clean on the ways.

FIG. 2.—NATIONAL ADJUSTABLE DIE STOCK.

A SPECIAL train leaving Chicago Feb. 22, carries 75 employes of the American Tin Plate Co. and 25 office employes of the National Steel Co. to New York.

METHOD OF MINING AT THE BADGER MINE.*

BY O. C. DAVIDSON.

The ore deposit at Commonwealth, Wis., known as the Badger mine of the Commonwealth Iron Co., was first found in April, 1891. The ore was discovered by test-pitting, which also showed that the drift above the ore was from eight to 20 feet deep, and averaged about 12 feet. We were anxious to secure as large a product this season as possible, as ore was in good demand, and it was decided to strip the ore body, and at the same time start sinking shafts.

The ore body as far as we had traced at that time, was a little over 500 feet long and 90 feet wide at its widest point. Three single skip shafts were started in the foot-wall, the distance between them being 250 feet. The east shaft, owing to the position we were compelled to locate our railroad tracks, would have proven inconvenient if sunk on an incline, and this shaft was, therefore, made vertical. The other shfats were sunk at an angle of 68 degrees from the horizontal, and this we afterwards found to be very near the actual dip of the foot-wall.

The 72,435 tons of ore shipped the first season came from the 80 foot level, and during the next winter the shafts were sunk 100 feet deeper, and the mine was worked as an open pit to a depth of 180 feet, the ore being obtained by the milling method, and by underhand stoping. In order to work the mine as an open pit to the depth of 180 feet, and to secure all the ore on the hanging side, it was necessary to hoist a great many thousand tons of the red slates forming the hanging wall. This is a portion of the work that we do not refer to with any pride, as we now realize that it would have been more economical to have stopped open pit work at a depth of 100 feet, and work from that depth as we did below the 180-foot level.

The next level was opened up 90 feet below the bottom of

*Read at the Iron Mountain, Mich., meeting of the Lake Superior Mining Institute, February, 1900.

the open pit. A drift was driven in the foot-wall connecting the shafts, and from this drift were driven cross-cuts every 65 feet. Directly above these main cross-cuts, sub-cross-cuts were driven, at a depth which, when worked out, would give us a stope 70 feet high and have a back or floor of ore above us 20 feet thick. Those main cross cuts and sub-cross-cuts were then connected with raises, which were placed at such points as would best enable us to separate the three grades of ore that were mined. Chutes were built in the bottom of these raises and the ore was mined by the milling method precisely as it in the open pits, except that we left pillars across the ore body 25 feet thick, and worked the ore out in stopes 40 feet wide and 70 feet high. The mine was opened up and worked in this manner, the levels all being 90 feet apart until the depth of 540 feet was reached, but at this depth the merchantable ore was practically pinched out. There was also a decided pinch of the ore body to the west, so that the east shaft was only carried to a depth of 270 feet, and as the ore in the east end of the deposit pinched out, the rooms were filled with rock from the hanging wall, mills being built up as milling progressed. When the bottom room was nearly filled, the floor above it was mined out and sent down through the mills, and after the floors were all taken out, the work of mining the pillars was begun. We first tried undercutting the pillars, but this was not at all successful, as the pillar would not settle as it should, and rock from the adjoining filled rooms would come in where it was not wanted. We, therefore, began top slicing, and have found this very satisfactory, both in the matter of cost of ore and because practically all of the ore is secured.

The product of the Badger mine up to the first of the present month is 1,368,703 tons of ore. We think the method of underground milling which we adopted enabled us to secure a larger product per man per day than could have been secured any other way. A great deal of drifting is required with this method, but though the ore is tough and does not require any timbering, it does not drill hard, and the cost of drifting is therefore very moderate. Very soft ore bodies or stratified or seamy ores could not probably be worked with safety in this manner, but as an evidence of the physical character of the Badger mine ore, I would say that we had several stopes 70 feet high, 200 feet long across the vein and 40 feet wide, and in one place we mined out two floors before filling, thus leaving a room 270 feet high. It was our custom to confine our winter work as much as possible to opening, stock-piling as little ore as possible, and then when the ore could be loaded direct into cars, increase our force. In this way we were able to attain a large product during the summer, our maximum product being 38,000 tons for one month.

E. M. Butz, civil engineer, Pittsburg, together with J. H. Hornebeck, of Illinois, and E. A. C. Pew, of Toronto, Ont., are the promoters of the Canadian Steel Co., which proposes to erect a plant at Ottawa, Can., on the Welland canal. The city authorities of Ottawa have offered the promoters a bonus in the way of exemption from municipal taxation for 25 years if the plant is erected within the city. In addition there is the government subsidy for every ton of steel produced. The Canadian government has been petitioned for a charter, and further, the promoters have requested that all their machinery for their plant be admitted free of duty. Until the latter point is decided the project will not take definite shape.

At a recent meeting of the stockholders of the Penn Iron & Coal Co., Canal Dover, O., the following were elected directors for the ensuing year: S. W. Croxton, H. C. Davis, C. H. Davis, J. P. Burton, Jr., and D. T. Croxton. The newly elected officers are as follows: S. W. Croxton, president; H. C. Davis, vice-president and treasurer; H. S. Ream, secretary; D. T. Croxton, superintendent. The report of the officers for the past year was very satisfactory.

The Sergeant Mfg. Co., Greensboro N. C., whose machine shop and office were burned on Jan. 1, are about to erect new buildings and more substantial. The new machine shop, which will be 48x132 feet, of two stories, will be a combination of brick and iron. The equipment of the machine shop will be the most modern.

IRON AND STEEL IMPORTS AND EXPORTS.

We have given the totals and the principal items in the statement of iron and steel imports and exports for 1899. In the current *Bulletin* of the American Iron and Steel Association appear the verified statistics, calculated so far as weights are given by the Treasury Department, in gross tons. We reproduce the tables below. In the calendar year 1890 the total exports of iron and steel amounted to $27,00,000, and in 1899 they were $105,689,645. Meantime the importations of manufactures of iron and steel have decreased with nearly equal rapidity, the importations of 1890 being $44,544,140 and those of 1899 $15,709,206. The import table follows:

Imports—Gross tons.	Twelve months 1899.	
	Gross tons.	Values.
Pig iron	40,372	$1,339,206
Scrap iron and scrap steel	11,675	165,745
Bar iron	19,792	942,347
Iron and steel rails	2,134	70,751
Hoop, band, or scroll	663	33,492
Steel ingots, billets, blooms, etc.	12,601	1,287,725
Sheet, plate, and taggers'	7,043	464,297
Tin plates	58,915	3,738,567
Wire rods, iron or steel	17,964	873,398
Wire and wire rope	2,363	400,952
Anvils	240	32,842
Chains	188	26,564
Total	173,950	$9,375,886
Iron ore	674,098	$1,083,045
Manganese ore	188,349	1,584,528

The above imports are given in tabulated form because we can give weights as well as values, but our total imports of iron and steel in 1899, including machinery, cutlery, firearms, etc., for which weights are not obtainable, amounted to $15,799,206 in foreign value. There were no cotton ties imported in 1899 or in 1898.

The following table gives the quantities and values of our exports of leading articles of iron and steel and of iron ore in 1899, compiled from the same summary:

Exports—Gross ton.	Twelve months 1899.	
	Gross tons.	Values.
Ferro-manganese	13	$816
All other pig iron	228,640	3,281,425
Scrap and old, for manufacture	76,652	952,402
Bar iron	10,603	407,161
Band, hoop, or scroll iron	2,869	117,002
Bars, or rods of steel	30,728	1,038,336
Billets, ingots and blooms	25,605	546,487
Cut nails and spikes	9,974	482,882
Wire nails	33,535	1,667,976
All other nails, including tacks	2,076	289,797
Iron plates and sheets	6,196	356,791
Steel plates and sheets	50,536	1,690,510
Iron rails	6,442	96,135
Steel rails	171,272	6,122,382
Wire	116,312	5,526,930
Steel wire rods	16,992	524,466
Structural iron and steel	54 244	2,059,289
Locomotives.....No.	487	4,767,850
Total	842,669	$29,928,637
Iron ore	40,690	$76,687

Like our imports of iron and steel the weight of all our exports of these products is not a matter of record. Our total exports of iron and steel in 1899, which include locomotives, car wheels, machinery, castings, hardware, saws and tools, sewing machines, stoves, printing presses, boilers, etc., amounted to the enormous and wholly unprecedented sum of $105,689,645 in 1899, against $82,771,550 in 1898 and $62,737,250 in 1897. Our exports of agricultural implements, which are not included above, amounted in 1899 to $13,594,524, against $9,073,384 in 1898 and $5,302,807 in 1897.

A. G. Cooper, of the C. & G. Cooper Co., Mt. Vernon, O., has been in Pittsburg the past week to superintend the placing of engines and machinery in the Page Woven Wire Co.'s plant, at Monessen, Pa.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Empire Rolling Mill Co. was incorporated at Columbus, O., last week by Cleveland men. James Paton, formerly superintendent for the Cleveland Rolling Mill Co.; John D. Paton, formerly superintendent in the Crescent Tin Plate Mill, Newburgh; U. G. Walker, treasurer of the South Cleveland Banking Co.; Louis Round, for many years in chain manufacturing business, and W. R. Dunbar. Contracts will be let immediately and the incorporators expect to have a puddling and rolling mill in operation in six months. The mill will employ 175 men and will be located at the crossing of the Erie and C. & P. Railroads. The cost will be about $150,000. The product will be bar iron, steel bars and guide iron.

At Pottstown, Pa., citizens are working on a steel casting propositon. Outside interests have $60,000 to invest and Pottstown is asked to take $10,000 in stock and loan the company $30,000.

W. F. Rainey, Cleveland, will buy a steam shovel.

The Tallerday Steel Pipe Co., of Waterloo, Ia., capital stock $20,000, Franklin G. Tallerday, James M. Gorst and C. B. Campbell directors, has been incorporated for manufacturing purposes.

The United States Steel Co., a $1,000,000 company formed to treat steel by a special process, has purchased about 3,000,000 square feet of land in Everett, Mass. Charles S. Miller, treasurer of the company, is quoted as saying: "Our plans for our first foundry are in the hands of the E. G. Spilsbury Engineering Co., of New York, and we expect to break ground for foundations about March 1. The building will be 120x200, of steel construction, and the company will employ about 250 men. An electrical power plant will also be built to supply power to our steel plant, as well as to other manufacturers, and we will build a dock."

TheJames A. Brady Foundry Co. has been incorporated at Chicago, with a capital stock of $15,000, for manufacturing iron goods, by George M. Davis, James A. Brady, and D. W. Buchanan.

The Illinois Engine & Machinery Co. has been incorporated at Chicago, with a capital stock of $2,500, to manufacture gas and steam engines, by Chas. A. Williams, Jacob H. Graf and John R. Williams.

The Buffalo Steel Co., of Tonawanda, N. Y., capital $260,000, was recently incorporated. Directors are Leopold E. Black, Philip D. Black, George H. Jones and John W. Thomas, of Chicago; Joseph Black, of Cincinnati, O., and Jacob Joseph and John H. Porter, of Buffalo. The company is connected with the Inland Iron & Steel Co., and the plant is the new Buffalo extension of that company's operations.

F. R. Phillips' Sons Co., Philadelphia, Pa., wants rotary shear to cut ½ inch plate and 12-inch bar train complete.

The West Point (Ga.) Iron Works will buy a second hand 100 or 120 h. p. Corliss engine, two 100 h. p. water tube boilers, new or second hand.

The George Foundry & Machine Works, Rome, Ga., are in the market for 30 to 34-inch by 16-foot lathe, 40 to 50-inch boring mill, both second hand.

Vaughan & Fuller, Winchester, Tenn., will buy a second hand shaper, large drill and a planer.

The Ornamental Iron & Wire Co., Chattanooga, Tenn., wants one double punch and shear, small hand punch for wire work, sheet iron shears, light hand drill press, wire straightener and cutter, lathe and pipe cutter combined.

Statler-Bischoff Co., Rockwell and Fillmore sts., Chicago, wants a 10-foot power shear, No. 10 gauge, second hand.

The Middletown (O.) Machine Co. will purchase 36 inch engine lathe 42 inch or 48-inch planer with two heads.

Damon Safe & Iron Works Co., Boston, Mass., is in the market for one 10 or 12-foot vertical boring and turning mill.

Fires and Accidents:—

A riveting shed and paint shop, property of the Pressed Steel Car Co., Allegheny, were last week destroyed by fire. The loss is estimated at $2,000.

A blast furnace slip at Joliet, Ill., Feb. 14, and an explosion threw a quantity of material upon the roof of an adjoining building, breaking down the steel supports and burying several men under the wreckage. One was killed. The loss is $3,000.

The plant of the Western Foundry Co., at 36th st. and Albany ave., Chicago, was destroyed by fire Feb. 13, the loss being about $40,000. It is the intention of the company to rebuild the plant at once. The loss was nearly covered by insurance.

New Construction:—

The Grasselli Chemical Co., of Cleveland, will shortly erect a large plant in the Birmingham, Ala., district.

The Kewanee Boiler Co., Kewanee, Ill., has plans prepared for a new plant, to consist of a main building, boiler shop, power house, machine shop and forge room, and foundry.

The Union Steam Pump Co., Battle Creek, Mich., will build a three-story machine shop this spring.

At York, Pa., the Morton Mfg. Co. will erect a plant for the manufacture of agricultural implements.

The Toledo Bridge Co., Toledo, O., has been investigating locations for a new plant.

At Philadelphia a two-story steel and brick addition, 99x113 feet, will be built to the main foundry of William Wharton, Jr., & Co.

At Omaha, Neb., the Under Feed Furnace Co., recently incorporated, have let the contract for a foundry to be erected in East Omaha. James B. Badger is secretary and general manager. The new building, which adjoins a plant the company has secured, will be 60x100 feet. Work will begin at once.

Clerkin & Maag, furnace manufacturers, at Akron, O., plan to erect a foundry the coming summer.

The incorporation of the Columbus Malleable & Gray Iron Casting Co., Columbus, O., was authorized last week. The capital stock is fixed at $25,000 and the incorporators are: Otto C. Klie, H. T. Irvin, Charles A. Klie, Robert S. Neil and D. Birney Neil. The foundry is to be built on the East Side, near the Case Mfg. Co.'s plant. Arrangements are being made to manufacture a patented product now controlled in Columbus.

The Witte Iron Works Co., Kansas City, Mo., will erect a new building 63x100 feet.

The Christensen Engineering Co., Milwaukee, received bids last week for a new $12,000 power house, 38x100 feet.

The new machine and warehouse of the Lorain Steel Co., Lorain, O., will be erected by the company's construction department.

The Frost Mfg. Co.'s new plant at Galesburg, Ill., will consist of a machine shop, 75x250 feet; power house, 40x60; boiler shop, 75x250; foundry, 60x160; blacksmith shop, 40x60; wood working shop, 40x80; a two-story pattern storage building, 50x160; a two-story warehouse, 35x135; a two-story office building, 40x40; casting shed, 50x75.

The Franklin Steel Casting Co., Franklin, Pa., expects to double the capacity of its plant.

At Duluth, Minn., McMartin & Co., workers in sheet metal, will erect a new building and add to their equipment.

The Blalock Foundry, South Pittsburg, Tenn., will erect new and enlarged shops with foundry floor room for 250 molders.

Half the structural steel of the new plant of the Pennsylvania Malleable Co., at McKees Rocks, Pa., is up and the company expects to cast gray iron by March 15 and malleable by April 1.

Bids have been received by Architect De Nean, Merion Title Bldg., Philadelphia, for the new plant of the Pittsburg Auto Car Co., to be erected at Ardmore, Pa. It will be 60x110 feet and two stories.

At Davenport, Ia., the Davenport, Rock Island & Northwestern Railroad will build machine shops the coming summer.

General Industrial Notes:—

A National Export Association silver medal, for blast furnace and rolling mill high grade fire brick, has been awarded by the committee of awards of the Franklin Institute, Philaphia, John Birkinbine, chief, to the Kentucky Fire Brick

A COCHRANE STEAM SEPARATOR

Vert. Form.

is not expensive, and it has the ability to insure dry steam, either when there is not much water, or when there is a great deal of water coming with the steam. Just the appliances for long lines of piping, for use on exposed pipes, or in connection with boilers that prime.

We build these *COCHRANE STEAM SEPARATORS* in a wide variety of forms; for horizontal pipe; for vertical pipe; to take the place of ells; others with specially large receiver capacity for storing steam close to engines, or taking care of very heavy flushes of water.

We also make the

COCHRANE OIL SEPARATORS.

Do you wish to save and use your condensed exhaust? To do this you must "take the oil out." There is no appliance on the market to-day that can give as high efficiency in this service as our *COCHRANE OIL SEPARATORS;* not simply because we say so — ask boiler inspectors. More than 1,500 of these Oil Separators in successful operation.

HARRISON SAFETY BOILER WORKS, Philadelphia, Pa.

Works, Firebrick, Ky. Investigations were made into the records, analyses of the brick and of the raw flint clays.

The list price of the "Selden" patent packing was advanced recently to 80 cents per pound for that with rubber core, and 60 cents per pound for packing with the canvass core. The manufacturer, Randolph Brandt, 38 Cortlandt st., New York, states that the higher price has been made necessary by the largely increased cost for manufacturing and marketing.

The works of the Cambria Steel Co., at Johnstown, Pa., will be very greatly extended in the coming year, the improvements costing fully $2,000,000. They will include a number of open-hearth furnaces.

Work has been suspended at the Corns Works of the Republic Iron & Steel Co ,at Massillon, O., and no date has been set for resumption.

It is reported that a ten-mill tin plate plant will be built in connection with the Sharon Steel Co.'s plant, Sharon, Pa. The enterprise will be undertaken, it is said, by a company distinct from the Sharon Steel Co., and Pittsburgh capialists are interested.

The Austin Separator Co., of Detroit, Mich., manufacturer of the Austin steam and oil separators, has just shipped an order of seven of its 7-inch new pattern Fig. E. iron horizontal receiver machines for use in the immense new power plant of the London & Bristol Tramway Co., London, Eng., in connection with Allis engines. This is one of the most important power plants installed in the past year in Great Britain, and the selection of the Austin separator is naturally a matter of great satisfaction to the manufacturers.

The Colonial Coke Co., of Smock, Fayette county, Pa., was granted a charter last week. Its capital stock is $50,000. The directors are: Henry B. Shields, Girard, O.; Carrie E. Warner, A. M. Snyder, H. B. McGraw, Cleveland; Samuel E. Ewing, John W. Dawson, Alexander A. Ewing, Uniontown.

At the annual meeting of stockholders of the Andover Iron Co., held at the company's main office at Phillipsburg, N. J., on Feb 14, the following were elected directors: Edward Roberts, Jr., Calvin Pardee Henry P. McKean, Herbert M. Howe, James Logan Fisher and Joseph B. Altemus, all of Philadelphia, and George W. Stickle, of Rockaway, N. J.

Nothing has yet come out of the negotiations for the Troy Steel Co. plants at Breaker Island. Cullen Bros. & Lewis Steel Co., East Orange, N. J., has presented a proposition to the stockholders. It is intended to spend a considerable amount improving the plant. The Renssalaer Iron Works and Albany Iron Works are also included, and the iron mines of Witherbee, Sherman & Co. at Mineville and Port Henry, N. Y., now in the possession of George T. Murdock as receiver.

The Pittsburg District :—

Jones & Laughlins, Ltd., Pittsburg, have begun the installation of 25 Cahall boilers of 10,000 h. p. capacity each. The boilers will be arranged in two batteries, one to consist of 15 and the other of 10 boilers. They will be used to generate power to operate the new plants which they have under construction. The larger battery of boilers is to be used for furnishing power for the new beam mill.

The National Tube Co. will let the contract March 1 for a new plant at Christy Park, near McKeesport, Pa., to cost $300,000. The contract for the machinery, which is to be of especial design, have already been made with eastern firms.

The Columbia Bridge Co., of Edenburg, Pa., is delivering material for the erection of the new pipe mill of Spang, Chalfant & Co., Pittsburg. There will be five buildings in all, the main building will be 500 feet long and 100 feet in width while the smaller buildings will average 50 feet by 250 feet.

The Oil Well Supply Co., Pittsburg, which recently purchased the plant of Ireland & Hughes, will shortly erect a machine shop and tool factory adjacent to it. Oil drilling apparatus will be the chief product.

The E. & T. Fairbanks Scale Co., St. Johnsburg, Vt., commenced suit in the United States court last week against the Standard Scale & Supply Co., Ltd., Pittsburg, for alleged infringement of the patent on the improved Fairbanks iron frame truck scale, such as is used by manufacturing concerns and railroad companies. William H. Black, secretary of the Standard Co., says that the charges of infringement only relate to the 60-foot extension scale, used in weighing double cars. These scales he said have been made by his company ever since it has been in the scale manufacturing business.

Hyde Bros. & Co., 902-3 Lewis Bldg., Pittsburg, are putting in their water tube boiler at the following plants: Tyrone Iron Works, Tyrone Forges, Pa.; Scranton Bolt & Nut Co., Scranton, Pa.; Pullman Car Works, Pullman, Ill.; Reeves Iron Works, Canal Dover, O.; Emlyn Iron Works, East Chicago, Ind.; Laramie Iron & Steel Co., Laramie, Wy.

The 125 ovens which the H. C. Frick Coke Co. is building in the Connellsville region will be completed about April 1.

The new car yard which the P. & L. E. Railroad will operate in McKees Rocks, Pa., will greatly facilitate the

MALLEABLE

HIGH GRADE CASTINGS. QUICK DELIVERIES.

BUHL MALLEABLE CO., Detroit, Mich.

Our No. 1 Shop Saw.

Pneumatic Tools,
Hammers, Riveters,
Drills, Hoists.

Our hammers are especially suited for machinists' work. No vibration and great speed on cast iron and steel.

Shop Saws

For cutting tool steel and all softer metals. Equipped with gravity or automatic feed.

Power Saws.

THE Q AND C

CHICAGO
NEW YORK

handling of freight cars in the Pittsburg district. It will have a capacity for handling 1,125 cars, 15 tracks, for holding 75 cars each. An air station to supply trains will be in proximity to the new yard.

The American Steel & Wire Co. continues to purchase land on Neville Island, below Pittsburg, where its plants in the Pittsburg district will be concentrated. Last week nine acres were purchased in addition to its already large holdings on the island. A tract of 16 acres was purchased in Stowe township, opposite Neville Island, in Allegheny County.

The Homestead Mfg. Co., Homestead, Pa., will move its plant about April 1 to Pittsburg.

At the annual meeting of the stockholders of the New York & Cleveland Gas Coal Co., held in Pittsburg last week, it was decided to continue the organization and style of the company for the ensuing year. The majority of the stock of the company is controlled by the Pittsburg Coal Co., but the company will be continued as an independent organization. The following officers were elected for the ensuing year: President, W. P. DeArmit; first vice-president, A. W. Mellon; second vice-president, C. L. Dickson; general manager, T. B. DeArmit; board of directors, A. M. Neeper, W. H. Berger, W. H. Nicholson, J. B. Homberger, John Shaw.

The annual meeting of the Mansfield Coal & Coke Co. stockholders was held in Pittsburg last week. The company is independent. The following officers were elected: President, James F. Armstrong; vice-president, John F. Scott; secretary, W. H. Shinn; treasurer, James T. Armstrong; directors, H. K. Porter, Henry Lloyd, George A. Berry, William Stewart, and W. E. Lincoln.

The Mesta Machine Co., Pittsburg, was granted a writ in the Allegheny county courts last week, temporarily restraining the Union Railroad Co., which is controlled by the Carnegie Steel Co., from trespassing on its property, fronting on the Monongahela river in Mifflin township. This extension of the Union Railroad Co. is to connect with the bridge which the Carnegie Steel Co. will build across the Monongahela river at this point for the purpose of conveying hot metal from the new Carrie furnaces to the Homestead works. Congress last week authorized the erection of this bridge and work will be commenced at once. It will be of steel construction.

The Stephenson Mfg. Co., Pittsburg, has been formed with a nominal capital of $50,000. A charter will be applied for within a week. The company will enter into the manufacture of stoves, ranges, water heaters and furnaces on a large scale. R. S. Stephenson, John C. Bash, F. M. Love and others are interested.

The McDowell Mfg. Co., Pittsburg, was granted a charter last week by the state. It is capitalized at $20,000. The incorporators are John G. McDowell, George F. Williams, Samuel Garrison, D. H. Littell and George K. Herron, all of Pittsburg.

The Ideal Machine Shop.

The ideal and often real machine shop of today is in handsome and roomy buildings, with abundant lighting, heating and ventilation; with clean ceilings and walls, and floors arranged in orderly fashion. We see steam power (if such be used) generated with a small fraction of the fuel formerly consumed, driving quick-running shafting mounted in roller bearings and adjustable hangers, carrying light, true pulleys, easily interchangeable, operating narrow, quick-running belts, and supplying abundant power to the tools below.

Or, as a better alternative, we see these tools arranged regardless of the straight rows and constrained positions due to the shafting system, and driven by individual electric

"PIONEER"

Alabama Coke *PIG IRON.*

We have been appointed selling agents for the famous PIONEER brand and respectfully solicit inquiries and orders for it.

Rogers, Brown & Co.

Cincinnati. Buffalo. St. Louis. Chicago. Philadelphia. Cleveland. Birmingham. New York. Pittsburg. Boston.

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.

Proprietors of the CELEBRATED Mount Savage Fire Brick

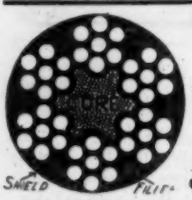
GOVERNMENT ‡ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Alleganv County, Md.

Branch Offices:—No. 1 Broadway, New York, N. Y.; Land Title Bldg., Broad & Chestnut Sts., Philadelphia, Pa.; Fergusen Block Pittsburgh Pa. Stowe, Fuller & Co., 249 Arcade, Cleveland, Ohio; N. A. Williams Co., 219 E. Washington St., Chicago, Ill.



WHY NOT PRESERVE YOUR Wire Ropes, Manilla Ropes, Gearing? Catalogue L tells how.

THE IRONSIDES COMPANY, COLUMBUS, O., U. S. A.

When writing to advertisers, kindly mention this paper.

THE RIVERSIDE FOUNDRY CO., Cleveland, O.

Rolling Mill, Rod Mill, Wire Mill and Blast Furnace CASTINGS of Every Description.

CHILLED AND HARD GUIDES A SPECIALTY.

OTIS STEEL

"OTIS" FIRE-BOX PLATES A SPECIALTY.

Flange Plates, Ship Plates Tank Plates, Steel Car Axles and Forgings of all Kinds.

Steel Castings from 100 to 75,000 lbs.

Head Office and Works, CLEVELAND, OHIO.

Agencies: NEW YORK, 97 Cedar St. CHICAGO, Old Colony Bldg.
ST. LOUIS, 516 N. Third St. WASHINGTON, Kellogg Bldg.
MONTREAL, Homer Taylor, 183 St. James St.
SAN FRANCISCO, John Woodlock, 154-156 First St.

Hercules Process

STEEL CASTINGS

Free from blowholes. True to pattern. Fine Finish.

For particulars
Send for circular M.

HERCULES STEEL CASTING CO.,

Harvey, Ill.

The Iron Founder

A comprehensive treatise on the art of molding, including chapters on core making, loam, dry sand and green sand molding, also crystallization, shrinkage and contraction of cast iron and a full explanation of the science of pressures in molds, added to which are formulas for mixtures of iron, tables, rules and miscellaneous information. By SIMPSON BOLLAND. Illustrated with over 300 engravings. 12mo.; cloth $2.50

Sent, postpaid, on receipt of price, by

The Iron Trade Review Co.,

CHICAGO. CLEVELAND. PITTSBURG

motors fed by concealed wires leading from below the floor, the overhead space being entirely clear for light, air, safety and beauty, while giving room for improved electric hoisting apparatus of various kinds.

With either of the above systems (the last mentioned happily looming up in the ascendant) we see clean, attractive, intelligent workmen running cutting tools at much higher speeds than formerly, often with special lubricants, using all the improved machines, semi-special and special, which can be adapted to the particular work in hand, all with a resulting output not dreamed of even less than a generation ago.

It is probable that the improvements of the next few years will follow chiefly the lines of simplified design and construction of product, more special tools, better and faster cutting methods, better architectural and power transmitting shop arrangements, more extended use of electricity for driving, doubtless leading eventually to the total abandonment of belting and shafting, and, last but not least, more harmonious and conciliatory arrangements between employers and employes, in office, in draughting room or in shop.

This will doubtless be brought about by further "combination" on both sides, with boards of conciliation, managed by both parties, to settle upon mutually satisfactory conditions, thus conducing to the intellectual, moral and financial happiness of all concerned. The importance of a contented, yet ambitious, personnel, in addition to a materiel which is mechanically above reproach, cannot be too strongly impressed upon all those earnest souls who are making the machine shop

U. BAIRD MACHINERY CO.,

423-425 Water St., **PITTSBURG, PA.,** 124-126 First Ave.

Machine Tools and Supplies. Send for list of Second-hand Tools.

Ore and Coal Handling Machinery

For Blast Furnaces, Docks and Mines,

MINING MACHINERY,
HIGH GRADE HOISTING ENGINES.

WEBSTER, CAMP & LANE MACHINE CO., Akron, Ohio.

Denison, Prior & Co.,

BANKERS AND BROKERS,

309-312 Garfield Building, Cleveland, O.,

offer unsurpassed facilities for transactions in the iron and steel stocks, either listed or unlisted.

Private wire connections with New York, Chicago, Boston, St. Louis and Philadelphia.

Long Distance Telephone M. 1138.

Correspondence Solicited.

Conestoga Building, **EDWARD E. ERIKSON,** PITTSBURG, PA.

Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

FIRE BRICK.

BRANDS: O. K. CROWN. O. K. A.

SUITABLE FOR Furnace, Malleable, Mill, Foundry and Lime Kiln Work.

OAK HILL FIRE BRICK AND COAL CO., OAK HILL, OHIO.

FIRE BRICK

CHAS TAYLOR'S SONS CO.

Manufacturers of

FIRE BRICK and ENAMELED BRICK.

SHAPEWORK OUR SPECIALTY.

CINCINNATI, O.

Workers of Carter County (Kentucky) Clay.

Molder's Text Book, Price $2.50.

PHOENIX HORSE SHOES—ARE THE BEST HORSE SHOES MADE

CATALOGUE SENT ON REQUEST.

PHOENIX HORSE SHOE CO., POUGHKEEPSIE, N. Y.—JOLIET, ILL.

WE HAVE . . .

BEAMS and CHANNELS

in stock and can cut and ship promptly.

MACBETH & CO.,

CLEVELAND, O.

Telephone West 131.

KENTUCKY FIRE BRICK WORKS

CUPOLA BRICK.

KENTUCKY FIRE BRICK WORKS, PORTSMOUTH, O. HIGH GRADE FIRE BRICK BEST BLAST FURNACE & ROLLING MILL BRICK

STEEL WORKS BRICK.

FIREBRICK, KY.

FURNACEMEN Attention.

We have three direct steam elevator hoisting engines with capacities from 3 to 5,000 pounds, that were removed to make room for electric machines. All in good order. Write for particulars.

M. J. O'DONNELL & CO.,

Cleveland, O.

economies of today,—and of the days to come.—[Oberlin Smith, in Cassier's Magazine for February.

MARDI GRAS RATES.

To New Orleans and Mobile via Pennsylvania Lines.

Reduced rate tickets for annual Mardi Gras Festivities will be sold this year to New Orleans and Mobile, Feb. 19th to 25th, inclusive, good returning leaving those points not later than March 15th. Anybody may take advantage of the low rates, and any Pennsylvania Lines Passenger or Ticket Agent will furnish full particulars upon application.

Home Seekers' Excursions.

For information about reduced fares, through time, and other particulars regarding Home-Seekers' Excursions to the South and West apply to Pennsylvania Lines Ticket Agents.

Tourist Tickets to Florida and Winter Resorts in the South.

Ticket agents of the Pennsylvania lines will answer inquiries about low fares to Florida and winter resorts in the South. Full information concerning Tourist Tickets, time tables, etc., will be furnished free. Persons contemplating a Southern trip may secure valuable information on the subject by merely inquiring of the nearest representative of the Pennsylvania Lines, or by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O. Say where and when you wish to go, how many will be in the party, starting point, etc., and you will be promptly posted. The inquiry will not cost much effort—it will save considerable bother in arranging details, as they will be looked after gratis.

THE GRASSELLI CHEMICAL CO.

Cleveland, O.

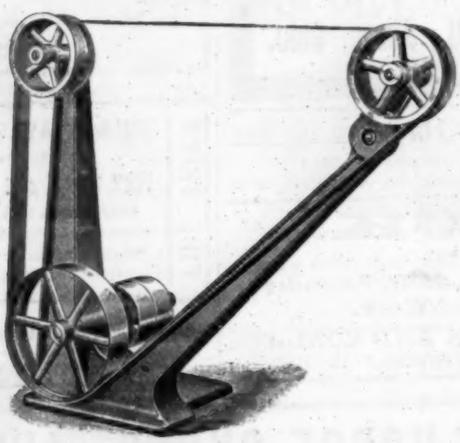
MANUFACTURERS OF

STRICTLY CHEMICALLY PURE

Sulphuric Acid,
Hydrochloric Acid,
Nitric Acid,
Aqua Ammonia.

Northampton Emery Wheel Co.,

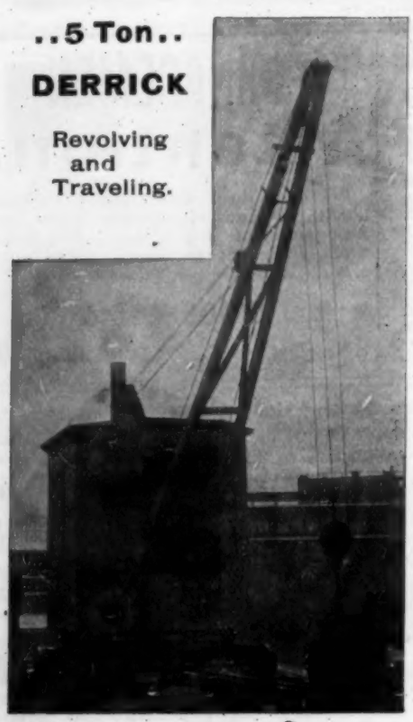
20 S. Canal St., CHICAGO, ILL.



No. 0 Strapping Jack. Carries belts up to 4 inches wide and 10 feet and 12 feet long.

COMPLETE CATALOGUE ON APPLICATION.

..5 Ton..
DERRICK
Revolving and Traveling.



DERRICKS

For handling Iron Ore Coal and Sand...

WE ALSO MAKE

Car Unloaders,
Stone Quarry Machinery,
Coal and Ore Buckets,
Hoist Engines,
Hand & Electric Cranes,
Clam Shell Buckets
and Boilers.

EXCELSIOR IRON WORKS CO.,

CLEVELAND, O.

Engineers, Founders, Machinists.

DIRECTORY

To the Iron and Steel Works of the United States for 1898.

PUBLISHED BY
THE AMERICAN IRON AND STEEL ASSOCIATION.

Thoroughly Revised. Price, Seven Dollars.

The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which ar large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

In the edition for 1896 there was given for the first time a complete list of Malleable Iron Works in the United States, and to this new feature there are now added complete lists of the Rail Mills, Structural Mills, Steel Casting Works, Bolt, Nut and Rivet Works, Chain Works, Seamless Tube Works, and Riveted Pipe Works—all new features.

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition It contains a complete list of all the

Blast Furnaces,
Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the UnitedStates.

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition ofthe Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

Sent postpaid, on receipt of price, by
THE IRON TRADE REVIEW CO.,
PITTSBURG, CLEVELAND, CHICAGO

FOR CAR WORK

and all malleable work there are no stronger or more satisfactory irons than

"Pioneer," "Antrim," "Elk Rapids"

LAKE SUPERIOR CHARCOAL IRON.

Superior Charcoal Iron Co.,

911, 912, 913 Michigan Trust Bldg.,

GRAND RAPIDS, MICH.

As we control its manufacture
Our steel, we know will never fracture.
And We our reputation stake
On every rivet that we make.
VICTOR BOILER RIVETS
MANUFACTURED BY
CHAMPION RIVET CO. CLEVELAND
ARE THE BEST RIVETS MADE

SHAFTING HANGERS COUPLINGS

Electrical Jack Shafts

Split Friction Clutches

Leading Original Specialties

Self Oiling Shaft Bearings

DODGE

PATENT

AMERICAN SYSTEM OF ROPE DRIVING

FOR ALL KINDS OF MANUFACTURING PLANTS, GRAIN ELEVATORS, BREWERIES, ETC., DESIGNED, FURNISHED AND ERECTED.

TRADE INDEPENDENCE MARK

OVER A MILLION OF THESE PULLEYS IN DAILY OPERATION.

THE ONLY ORIGINAL. BEWARE OF IMITATIONS.

DODGE MANUFACTURING CO.,

MISHAWAKA, INDIANA, U. S. A.

NEW YORK. BOSTON. CHICAGO. ATLANTA. LONDON, ENG.

ECONOMY DURABILITY EFFICIENCY

If You WANT TO SELL

If You WANT TO BUY

Second Hand

Machinery, Tools or Equipment

of any kind

See **Penton's List.**

Send ten cents in stamps for sample copy.

Address

PENTON'S LIST,

116 Griswold St.,

DETROIT, MICH.

The Monthly Official Railway List.

The "Every-Thirty-Days" List.

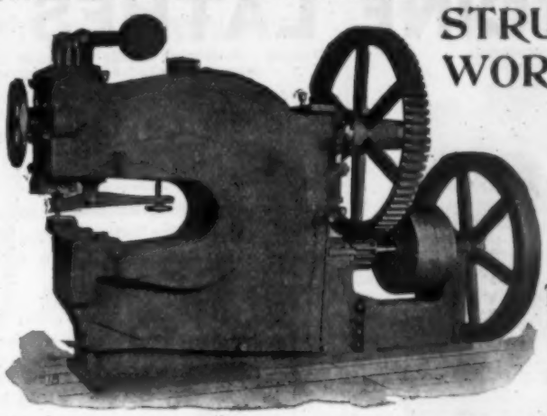
The January issue of the "RED" LIST is now out. If you are a railroad official you should have received your copy; if you have not, write us for it at once.

The MONTHLY OFFICIAL RAILWAY LIST.

315 Dearborn Street, CHICAGO.

BUY YOUR ADVERTISING as you do other material, by comparing prices and quality.

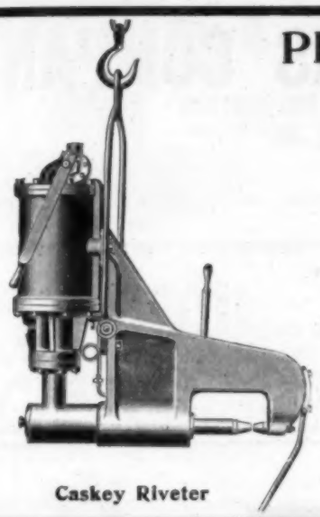
Compare the "THIRTY-DAY" List with any other similar publication as regards accuracy and completeness.



STRUCTURAL IRON WORKER'S PUNCH

with Architectural Jaw especially designed for punching angles, channels and beams, either in flange or web; boiler head flanges, ends of large pipe, etc. Has automatic stop and adjustable punch and die holder. Depths of Throat, 20, 26, 30, 36, 42, 48 and 54 in.

THE CLEVELAND PUNCH & SHEAR WORKS CO.,
980-986 Hamilton St., Cleveland, O.
Manufacturers of
Punches, Shears, Radial Drills, Rotary Planers, etc.
Write for Catalogue.



Caskey Riveter

PEDRICK & AYER CO., PHILADELPHIA, PA.

AIR COMPRESSORS,
Compressed Air Riveters,
Hoists, Cranes and other Tools
FOR SHOP, YARD AND FOUNDRY USE.

Our new line of Caskey Pneumatic Riveters comprise several styles and sizes and are adapted for any kind of work. These Riveters secure the maximum pressure on a rivet with as little weight in the machine as possible. They work rapidly, without jar or shock, and give a uniform pressure on every rivet.

SPECIAL STYLES BUILT TO ORDER.

MANNING, MAXWELL & MOORE, Sole SALES AGENTS.
85, 87, 89 Liberty St., NEW YORK.
Chicago: 22-24-26 S. Canal St. Pittsburgh: Park Building.
SEND FOR CATALOGUE. Cleveland: 26 S. Water St.

When writing to advertisers please mention The Iron Trade Review.

JAS. H BAKER MANUFACTURING CO.,
Park Building, PITTSBURG, PA., U. S. A.
We Make
CAR IRONS **FORGINGS** WAGON HARDWARE
To Order.

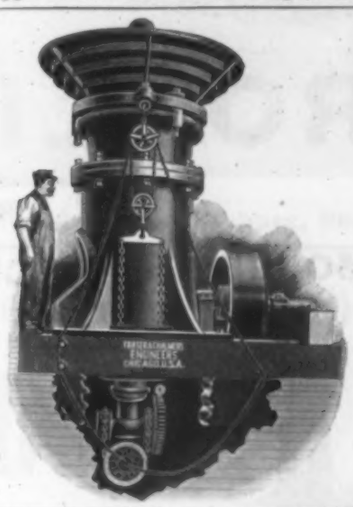
WATERBURY ROPE CO.,

Factories: Brooklyn, N. Y. Office: 69 South St., New York.
MAKERS OF
WIRE ROPE
OF ALL KINDS. ALSO
Manila, Sisal, Russia and American Cordage and Binder Twine, and
"WATERBURY" Transmission and Hoisting Rope.

The manufacturig world is kept busy these days filling orders and some manufacturers seem to have acquried the notion that the present is a capital season for postponing their advertising. "Wait," they say, "until business slackens. Then we will advertise to secure orders." That is to say, "Wait until dealers are all stocked up for the forthcoming year and then we will advertise for the fag ends of the season's business." The man who adopts this policy will be advertising at the very time his shrewder competitor, who adverties now, will be busy filling the cream of the late orders. It is all very well to be rushed with orders now; but if you want this state of things to continue you must work to secure orders for the future.—[American Artisan.

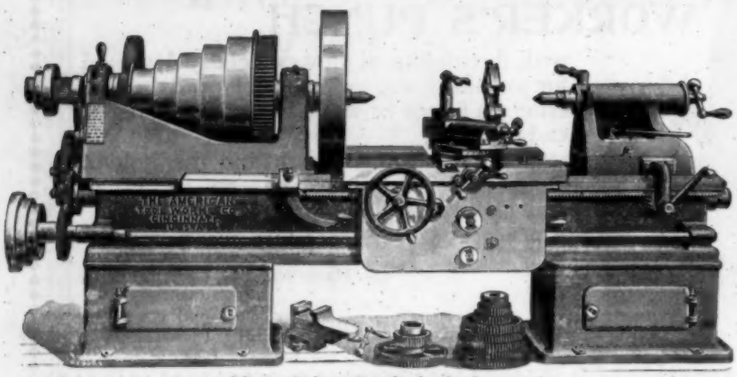
FRASER & CHALMERS

556 Washtenaw Ave., Chicago, Ill.



Comet Adjustable Rock Crushers, Mining Machinery, Stamp Mills, Smelters, Hoisting Engines.
Sole Makers of Riedler Pumps.
Samples on request.

STANDARD ENGINE LATHES



28-inch Swing Standard Engine Lathe.

With Every Improvement.

We build Standard Engine Lathes from 12-inch to 60-inch swing inclusive, having every possible improvement of value in an Engine Lathe.

Ask for information and prices before placing orders

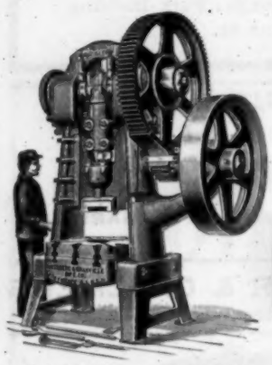
We are also builders of a complete line of high-grade tools for Machine Shop Equipment.

THE AMERICAN TOOL WORKS COMPANY,

WORKS: CINCINNATI, U. S. A.

New York Office: **120 Broadway, Geo. Place, Agent.** Chicago Store: **68-70 South Canal Street,**
Boston Store: **36 Federal Street.**
Philadelphia: **The Fairbanks Co.** Baltimore: **The Fairbanks Co.** New Orleans: **The Fairbanks Co.**
Cleveland: **The Strong Carlisle & Hammond Co.**

London: Alfred Herbert, Ltd., 7 Leonard St., Finsbury: E. C.
Coventry: Alfred Herbert, Ltd.
Berlin: de Fries & Co., Act. Ges., Kloster Strasse 13-15.
Dusseldorf: de Fries & Co., Act. Ges., Graf Adolf Strasse 83-87.
Paris: Roux, Frēres & Cie., 54 Bouelevard du Temple.
Vienna: de Fries & Co., Act. Ges., Eschenbachgasse 9.
Antwerp: Nyssens Frēres, 33 Rue des Peignes.
Moscow: Alfred Sucken.



WIRE MACHINERY

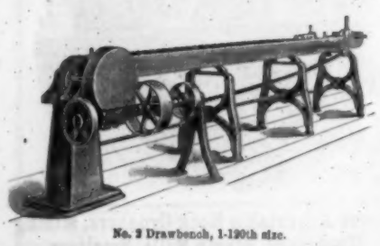
No. 7 A. Power Press geared 1-50th size.

No. 5 Automatic Drop Press 1-50th size.

ROLLING MILLS
PRESSES

MOSSBERG & GRANVILLE MANUFACTURING CO.,

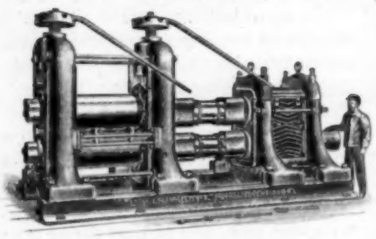
PROVIDENCE, R. I.



No. 2 Drawbench, 1-120th size.

NEW YORK, 126 Liberty St.

PHILADELPHIA. Bourse.



No. 9 Rolling Mill, 1 150th size.

Punches, Dies, Metal Stamping

IN

STEEL, BRASS, COPPER, ALUMINUM, GERMAN SILVER, ETC.

Send sample or sketch for prices. Novelties and patented articles made by contract.

E. KONIGSLOW & BRO.,
310-312 Seneca St., Cleveland, O.

Machinery For Reducing and Pointing Wire

By Compression or Cold Swaging.

Especially adapted to Pointing Wire Rods and Wire for Drawing. For machines or information, address

S. W. GOODYEAR,
Waterbury, Conn.

THE W. P. DAVIS MACHINE CO.

ROCHESTER, N. Y., U. S. A.

CUTTING OFF MACHINES.

SAMUEL R. Mason

ENGRAVING AND ELECTRO TYPING

CLEVELAND

We are particularly adept in mechanical wood engraving. Also make a specialty of fine half-tone photo engraving. Should be pleased to mail examples of our work on request.

Covert Mfg. Co.,

West Troy, N. Y.

DERBY SNAP,

With Plated Rust Proof and Guarded Spring.

"THE LATEST AND BEST."

For Sale by all Jobbers at Manufacturers' Prices.

The Cleveland Terminal & Valley R. R. Co

(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations..	*6:25 P M	*7:35 A M
Wheeling & Chicago.....	*2:25 P M	†7:25 A M
Akron, Canton & Chicago.....	*8:15 A M	*10:00 P M
Akron, Canton & Wheeling...	*10:20 A M	*3:30 P M
Akron, Canton & Chicago.....	*8:15 A M	*6:35 P M
Akron, Canton & Marietta....	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C., & Baltimore.....	*10:30 A M	*3:25 P M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago, also Washington, Balto and Philadelphia.

Molders' Text Book,

Being Part II of American Foundry Practice, giving the best methods and rules for obtaining good castings, with detailed description for making molds. A thoroughly practical book that should be in the hands of every molder. By Thomas D. West. 460 pages cloth..... $2.50

The Iron Trade Review Co.,

Water, Gas and Steam Fitters' Tools.

No. O Threading Machine. Power Attachment.

"ARMSTRONG"

ADJUSTABLE STOCKS AND DIES,

Vises (hinged), Improved Wrenches, Pipe Cutters, Clamp Dogs, Etc.

Improved Pipe Threading and Cutting-off Machines,

HAND OR POWER.

Our No. O machine is designed for threading the smaller sizes of pipe—iron or brass—also bolts. Has two speeds: one for pipe ⅛ to 1 in., the other for pipe 1¼ to 2 in. inclusive.

The Armstrong Mfg. Co.,

BRIDGEPORT, CONN.

☞Our catalogue will interest you

New York Office, 139 Center St.

Cleveland Tool Steel Balls

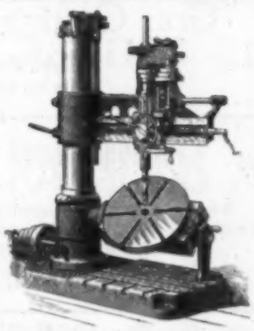
are the best and most suitable for machinery, anti-friction purposes and

MOTOR VEHICLES

Ask us what large firms we are now making regular shipments to.

The Cleveland Ball & Screw Co., 446-448 The Arcade, CLEVELAND, O.

Write for price list No. 2.



Bickford Quality

is the result of 25 years of hard work and good engineering. Our line of radial and multiple drills has been steadily improved and today embody all features requisite to modern practice. Drilling Machinery is a specialty with us, not a side issue, and we are today building the best that brains and money can produce.

THE BICKFORD DRILL & TOOL CO.,
Cincinnati, Ohio, U. S. A.

Air Compressors
for Air Lift Well Pumping.

Air Compressors
for Rock Drills, Coal Cutters, Air Hoists and Pneumatic work generally.

Pressure Pumps
for Cotton Oil Mills and Cotton Compressors.

Steam Pumps,
Single and Duplex, of all sizes and for all purposes.

Duplex and Triplex POWER PUMPS.

CORRESPONDENCE SOLICITED.

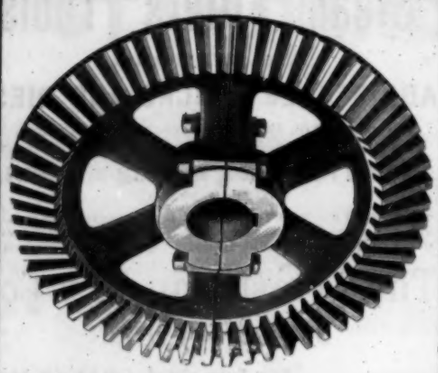
HALL STEAM PUMP COMPANY, Pittsburg, Pa.

Who builds the best Mine Pump?

PRESCOTT.

Fred. M. Prescott Steam Pump Co.,

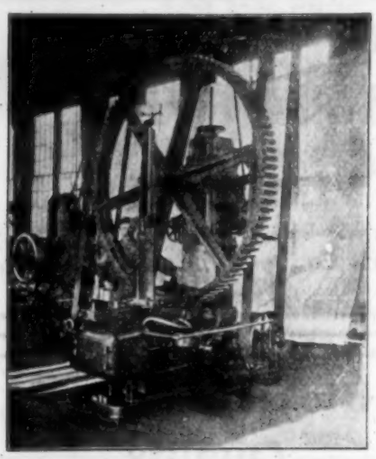
MILWAUKEE, WIS.



A BEVEL GEAR

Eight feet in diameter, twenty-four inch face, is interesting to mechanics. We are prepared to plane the teeth in such a gear, or smaller sizes, theoretically correct, which operation naturally adds to its effective and economical value. If you have such work to figure on, we would be pleased to have you correspond with us.

R. D. NUTTALL COMPANY,
Allegheny, Pa.



The VAN DORN & DUTTON CO.,
General Machinists and Engineers,
1796 East Madison Ave., *CLEVELAND, O.*

Gears and Pinions.

We make Gears of Steel, Malleable Iron, Cast Iron, Brass and Rawhide, and furnish them complete or cut as desired.

Gear Cutting of All Descriptions.

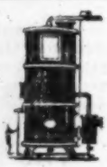
Material and workmanship the best.
Write us for estimate and prices.

GEAR CUTTING

Spur Gears,
Bevel and Mitre Gears,
Worm Gears,
Spiral Gears,
Internal Gears.

¼ to 50 inches diameter.
48 Diametral to 2 inch Circular pitch.

F. H. BULTMAN & CO.,
100-108 Canal St., CLEVELAND, O.



Pittsburg Feed Water Heaters and Purifiers,

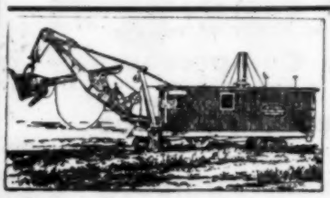
(Schlieper Patents).

Sweet's Steam Seperators, Ashton Pop Safety Valves, and Steam Gauges, Bonar Oil Filters, Bonar Gauge Cocks, Steam Appliances of all Kinds.

JAMES BONAR & CO., 1116 Carnegie Bldg., Pittsburg, Pa.

Larger paid circulation and larger list of advertising patrons than ever in its history. These THE IRON TRADE REVIEW now has. Advertising in it pays.

Subscribe for The IRON TRADE REVIEW, $3 per year.



THE BUCYRUS COMPANY,

DESIGNERS AND BUILDERS OF

Dredges, Steam Shovels, Excavating Machinery, Steam and Electric and Locomotive Cranes, Centrifugal Pumps, with Simple, Compound or Triple Expansion Engines, Pile Drivers Wrecking Cars, Placer Mining Machines.

SOUTH MILWAUKEE, WIS.

THE HOOVEN, OWENS & RENTSCHLER CO., HAMILTON, O.

Hamilton Corliss Engines.

Engines for Rolling Mills, Electric Railways and Electric Light.

Engines of all sizes and for all purposes.

46 South Canal St., Chicago.
39 and 41 Cortlandt St., New York.
Lewis Block, Pittsburgh, Pa.
Room A, Laclede Bldg., St. Louis, Mo.
C. C. Moore & Co., San Francisco, Cal.

PIG CASTING MACHINES,

Complete Installations
Guaranteed Results.

HEYL & PATTERSON, Engineers & Contractors,
PITTSBURG, PA.

FOUR-NIGHT.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME
*Daily. †Daily except Sunday.

xDaily except Saturday. ‡Saturdays only.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:10 pm	† 6:25 pm
Philadelphia and New York	* 2:10 pm	*11:30 am
Baltimore and Washington	* 2:10 pm	*11:30 am
Alliance and Pittsburgh	* 2:10 pm	*11:30 am
Ravenna and Alliance	* 5:10 pm	* 8:35 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Columbus and Cincinnati	* 8:35 am	* 5:40 pm
Indianapolis and St. L.	* 8:35 am	* 5:40 pm
Millersburg and Akron	† 3:10 pm	†12:10 pm
Col., Cin., Ind. & St. L.	x7:40 pm	*7:30 am

When you write to firms advertised in our columns, please mention the fact that you took their address from our paper. They will thank you for it.

TRADE MARK. REGISTERED.

FOR CASE-HARDENING,

CARBURIZER is the most efficient material.

It penetrates deeper, requires less time and is cheaper on account of its specific weight than any other material now in use.

CARBURIZER does not corrode the article and iron or steel does not become brittle if properly treated. **The Carbon projected into metal by our process is not lost if it be found necessary to reheat the hardened piece.**

CARBURIZER contains no obnoxious substances and is ready for immediate use.

For full particulars address

AMERICAN CARBURIZING CO.,
160 Pearl Street, NEW YORK.
Factory, Warren and Bay Sts., Jersey City, N. J.

FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES.

Castings and Propeller Wheels

Made from

PARSONS MANGANESE BRONZE

Cannot be excelled. Write for Particulars.

SOLE MAKERS

THE WILLIAM CRAMP & SONS'

Ship and Engine Building Company,

PHILADELPHIA, PA.

B.F.S. Co's **Flasks** are **All Right** so **Are Prices.**

Send for catalogue if interested.

Patent No. 580,205.

LATEST AND BEST.

YOU HAVE BEEN IT IMITATED.

BRASS FOUNDERS' SUPPLY CO., Newark, N. J

Selling Agents
FOR
Brass Founders Supply Co.:
THE
S. Obermayer Co.
Cincinnati and Chicago.
J. W. Paxon,
Philadelphia, Pa.
J. H. McCormick Co
Pittsburgh, Pa

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests
Per year **$3.00.**

THE STRUTHERS IRON & STEEL COMPANY,

STRUTHERS, OHIO.

Manufacturers of

SHEETS

Of the Very Highest Quality Only, Galvanized, Cold Rolled, Roofing and Corrugating. Soft Sheets for Stamping Purposes, both Bessemer and Open Hearth.

Our Galvanized Sheets are smoothly coated. No rough edges, soft and especially adapted for Cornice and Eave Trough Work. THERE ARE NO BETTER SHEETS MADE. We have our own Sheet Bar Mill and can ship promptly odd sizes and gauges for corrugating and roofing purposes.

Capacity 15,000 Tons Per Annum.

NATIONAL STEEL COMPANY,

AETNA STANDARD WORKS,

Office at Bridgeport, Ohio.

Manufacturers of

SOFT STEEL

SHEETS AND LIGHT PLATES
MERCHANT BARS AND SHAPES
GALVANIZED SHEETS
CORRUGATED AND FORMED SHEETS

SALES OFFICES: NEW YORK, Empire Building. CHICAGO, Marquette Building. SAN FRANCISCO, CAL., 23 Davis Street.

Oglebay, Norton & Co.,
LAKE SUPERIOR IRON ORES.
— AGENTS —
The Spanish-American Iron Co.,
Santiago, Cuba.
CLEVELAND. PHILADELPHIA.

Pickands,
Mather & Co.,

IRON ORE,
PIG IRON AND
COAL - - - -

CLEVELAND,
OHIO.

McKEEFREY & CO.,

PIG IRON,
COAL AND COKE.

LEETONIA, OHIO.

Drake, Bartow & Co.

IRON ORES.

515-516 Perry-Payne Building,
CLEVELAND.

The Originators and Only Makers of Inspected Foundry Pig Irons.

CLINTON and HECTOR

INSPECTED FOUNDRY IRONS

—FOR—

SOFTNESS, STRENGTH, FLUIDITY, UNIFORMITY.

MANUFACTURED BY

CLINTON IRON & STEEL CO.

FURNACES AND GENERAL OFFICES: Pittsburgh, Pa.
NEW YORK OFFICE: No. 15 Cortlandt St.

LAKE SUPERIOR CONSOLIDATED IRON MINES.

HIGH GRADE MISSABE ORES.

Adams, Ainslie, Duluth, Hibbing, Hartley, Linwood and Pillsbury Mines.
OGLEBAY, NORTON & CO., Sales Agents - Cleveland, Ohio.

Tod, Stambaugh & Co.,
LAKE SUPERIOR
IRON ORES.
206 Perry-Payne Building,
CLEVELAND, O.

J WESLEY PULLMAN,
IRON ORES
HELENBESSEMER
238 South 3rd Street
PHILADELPHIA.

The A B C of Iron,
NOW $1 00.

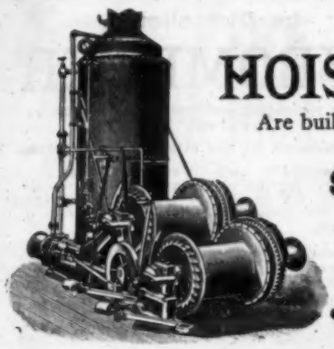
M. A. HANNA & CO.

IRON ORE,
PIG IRON AND COAL.

CLEVELAND, OHIO.

PICKANDS, BROWN & CO.,
PIG IRON.
IRON ORE
and **FRICK COKE.**
CHICAGO.

CABEEN & CO.,
Real Estate Trust Building, PHILADELPHIA.
Steel Billets and Slabs, both Bessemer and Open Hearth, Pig Iron, Manufactured Steel, &c.



LIDGERWOOD
HOISTING ENGINES
Are built to Gauge on the Duplicate Part System.
QUICK DELIVERY ASSURED.
STANDARD For Quality and Duty.
Steam and Electric HOISTS.
LIDGERWOOD MFG. CO.,
96 LIBERTY STREET, NEW YORK.
Chicago, Cleveland, Boston, Pittsburg
Philadelphia, Portland Ore. New Orleans.

Malleable Iron Buckets of Approved Pattern and Weight.

LINK-BELT Elevators and Conveyors.
for handling Slabs, Billets, Bar Iron, Coal, Ashes, Cement, etc. Shafting, Pulleys, Patent Machine-moulded Rope Sheaves, Clutches, etc.
LINK-BELT MACHINERY CO.,
ENGINEERS, FOUNDERS, MACHINISTS.
Chicago, U. S. A.
LINK BELT ENGINEERING CO., PHILADELPHIA and NEW YORK.

CRANES
AIR HOISTS.

NORTHERN ENGINEERING WORKS:
No. 6 Chene St., DETROIT, MICH.

CRANES •HIGH•SPEEDS•
•ELECTRIC•STEAM•HAND•
•MACHINERY FOR HANDLING COAL AND ORE WORKS
THE BROWN HOISTING AND CONVEYING MACHINE CO CLEVELAND, O.
NEW YORK 26 CORTLANDT ST • LONDON 39 VICTORIA ST. S.W.

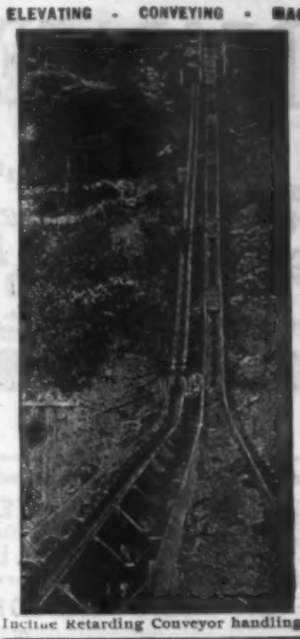
THE CLEVELAND CRANES OF ALL KINDS FOR ALL PURPOSES CRANE AND CAR CO SUPERIOR ST. CLEVELAND O.

THE EXETER MACHINE WORKS.
Pittston, Pa.
Manufacturers of High Grade
HOISTING ENGINES.
MINING, ELEVATING and
CONVEYING MACHINERY.
St. Louis Office: Chemical Building. Send for Catalogue "H".

ENGINEERS and DESIGNERS of FOUNDRY PLANTS.
Cranes for any service. Air Hoists.
The WHITING CUPOLA, 15 Sizes, 600 in Use.
Complete Equipments for Foundries. Catalogs Free.
Whiting Foundry Equipment Co. Harvey, Ill., U. S. A. (Chicago Suburb.)

The Iron Trade Review is an increasingly valuable medium, through which to sell equipments to machine shop and foundries.

The Jeffrey Mfg. Company,
Columbus, O., U. S. A.
ELEVATING - CONVEYING - MACHINERY.



Our Specialties Include Chain, Standard and Special, Sprocket Wheels, Elevator Buckets, Spiral Conveyors, Cable Conveyors, Link Belting Screens, Crushers Hoists, Dump Cars, Skipcars, Shafting, Hangers, Pulleys, Collars, Gearing.
Labor Saving Appliances of All Kinds.
Send For Catalogue.
Incline Retarding Conveyor handling Coal.

A. F. SMITH & CO.,
MANUFACTURERS OF
Fire Brick and Clay,
BEAVER COUNTY SAND STONE.
Telephone 42. NEW BRIGHTON, PA.

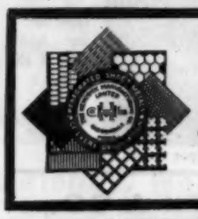
NEWS
that
IS NEWS.
Pointers that mean something.—That tell you where bids are asked and where building materials and supplies are wanted before the news is stale. THAT is the kind of pointers WE can give you.
Contractors, Builders, Decorators, Bond Dealers, Construction Men, Manufacturers and **Supply Houses** from every part of the country testify to the superior excellence and practical value of our Advance News Reports. If you want information that will PAY YOU write for particulars TODAY to the
Consolidated Press Clipping Co.,
159 La Salle St.,
CHICAGO, ILL.

THE IRON TRADE REVIEW
Is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

A firm needing a certain line of goods naturally turns first to those it has seen oftenest advertised, and with whose name it thus has become familiar. "Keeping everlastingly at it brings success."

PERFORATED METALS.

PERFORATED IRON, STEEL, COPPER, BRASS, TIN, ZINC, LEAD, ETC., TO ORDER.
LARGE AND VARIED ASSORTMENT OF SIZES. CORRESPONDENCE SOLICITED.
THE ROBERT AITCHISON.
PERFORATED METAL CO.,



PERFORATED PLATE SCREENS
AS REQUIRED FOR
STONE, ORE, ZINC, LEAD, and all Railroad and Mining Uses.
Special Screens for COAL and COKE.
THE HENDRICK MFG. CO., LTD.,
Samples and information upon request.
Carbondale, Pa.

JULIAN KENNEDY, ENGINEER.
Pittsburg, Pa., U. S. A.
MACHINERY FOR THE ECONOMICAL
PRODUCTION OF IRON AND STEEL.
CONSULTATIONS AND EXPERT WORK IN
General Engineering Practice.
Cable address "ENGINEER PITTSBURG."

STEEL CONSTRUCTION
IN ALL BRANCHES.
BUILDINGS DESIGNED AND ERECTED IN ALL PARTS OF THE WORLD.
Roof Frames and Trusses.
Blast Furnaces and Steel Works,
Cupolas, Ladles, Converters,
Boilers, Tanks and Heavy Plate Work.
RITER-CONLEY MFG. CO., PITTSBURG, PA.

The Wellman-Seaver Engineering Co.,
CONSULTING AND CONTRACTING ENGINEERS.
New England Bldg., CLEVELAND, O., U. S. A.
Cable Address, "Welsea" Cleveland.
Steel Works, Rolling Mills, Metallurgical Furnaces, Manufacturing Buildings, Machinery for the most economical handling of all kinds of material.
London Office: 47 Victoria St. WESTMINSTER. St. Petersburg Office: 27 Great Morskaia

Alex Laughlin & Co., Pittsburg, Pa.
Gas Heating - - -
Gas Puddling - - -
Open Hearth - - -
Crucible - - - - -
Tube - - - - - -
FURNACES
And Artificial Gas Producers of Every Description for Rolling Mills, Steel and Tube Works.
WE GUARANTEE to place all Plants erected by us in successful operation.

CREMER & BICKNELL, . . Chemists and Metallurgists, . . 24 Superior St., Cleveland, O.
Analytical and Testing Laboratory.
Reports on chemical and metallurgical processes. Analyses of ores, metals, fuels, railroad and foundry supplies, etc. Assaying—Gold, silver, copper ores. Mechanical Tests of Iron, Steel, etc. Our Testing Machine has been standardized by Insp. of Ordnance, U. S. A., for use on government work.

Le Chatelier's
PYROMETER
For measuring temperatures between 0 and 2900° F.
Recommended by the Highest Authorities.
Successfully used in establishments for the manufacture of

Gas,	Chamotte,
Chemicals,	Cement,
Sugar,	Accumulators,
Terra Cotta,	Incandescent Lamps,
Stone Ware,	Cartridges and Ammunition,
Porcelain,	Glass,

Iron and Steel, Malleable Iron.
Also by Boiler Inspectors, Schools and Colleges, for hardening and annealing steel in roll foundries, etc.
VULCAN MFG. CO., Ltd., Pittsburg, Pa.
Station D.

SHIFFLER BRIDGE COMPANY
BUILDING DEPARTMENT.
SPECIALTIES: Steel and Iron Buildings for Rolling Mills, Tin Plate Plants, Steel Works, Foundries, Factories, Roof Trusses, Girders, Columns, Beams, Corrugated Iron, Etc.
Main Office and Works:
48th Street and A.V. Ry., PITTSBURG, PA.
Branch Offices:
1214 Bets Building, Philadelphia, Pa.
45 Broadway, New York, N. Y.
228 Lumber Exchange, Minneapolis, Minn.
1243 Marquette Building, Chicago, Ill.

United Boiler Co.
GIRARD, OHIO.
Tanks, Boilers, Stills, Blast Furnaces, Heaters, etc., etc.
BOILER MAKING IN ALL ITS BRANCHES.
Repairs Promptly Attended to. Long Distance Telephone. Send for Estimates.

THE FORGE SHOP BELT.
There is no belting that is so perfectly adapted to the use of the Iron Works as the

LEVIATHAN.
It is unaffected by the temperature, whether high or low, and smoke, gas, or steam, do not affect it. In fact, conditions that would seriously impair the life and usefulness of a leather or rubber belt will not injure LEVIATHAN BELTING, nor detract from its wonderful strength and transmitting power.
Manufactured by
MAIN BELTING CO.,
1229-41 Carpenter Street,
PHILADELPHIA.
55-57 Market St. Chicago
120 Pearl St., Boston.

S. FIX SONS'
STEAM TUBE WELDING WORKS.
Manufacturers of reworked boiler tubes
Good second-hand tubes bought.
CLEVELAND, O.

IT PAYS
To advertise in the Iron Trade Review.

ÆTNA FIRE BRICK COMPANY,

Manufacturers of the Celebrated

ÆTNA HIGH GRADE FIRE BRICK,

Office and Works: OAK HILL, OHIO.

THE "CLEARFIELD" FIRE BRICK

MANUFACTURED BY

THE CLEARFIELD FIRE BRICK CO., Limited,

Office and Works at CLEARFIELD, PA.

Room 305 Ferguson Bldg., Pittsburg, Pa., John Richardson, Agent.

FIRE DOVER FIRE BRICK CO., MANUFACTURERS OF Furnace, Kiln and Special Shape Fire Brick. Office, 44 Mercantile Bank Bldg., CLEVELAND, OHIO. **BRICK**

FIRE BRICK For All Purposes.

CHICAGO FIRE CLAY PRODUCT CO.,

518 Chamber of Commerce, CHICAGO, ILL.

FIRE BRICK

Holmes, Strachan & Co.,

Manufacturers and Shippers

Steel
Savage Mountain
Holmes

Best made for Malleable Rolling Mill Furnaces and Cupola Linings.

DETROIT, MICH.

WALTER KENNEDY, Engineer,

BLAST FURNACE CONSTRUCTION.

BESSEMER AND OPEN HEARTH STEEL WORKS.

Office: 631 Penn Avenue, PITTSBURG, PA.

Telephone 3174.

Molding Machines

Lowest Possible Pattern Cost.

SUITED TO ALL CONDITIONS.

1. Gated Work, no Change in Patterns.
2. Vibrator Machines, no Stripping Plates.

The Tabor Mfg. Co.

ELIZABETH N. J.,

Improved Little Giant

MOLDING MACHINE.

In use in the largest foundries in the country.

SPECIAL MACHINES BUILT. Send for Catalogue.

T. FURLOW & SON,
Philadelphia Pa.

Mill Castings Of Every Description.

VULCAN FOUNDRY & MACHINE CO.,

New Castle, Pa.

INQUIRIES SOLICITED.

ONCE USED, ALWAYS USED

are STAR **Corundum** and **Emery Wheels.**

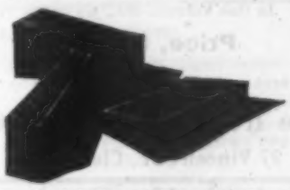
The Strongest, Safest, and Most serviceable WHEELS in USE.

Manufactured by

THE STAR CORUNDUM WHEEL CO.,
DETROIT, MICH.

Fire Brick, Cupola Blocks, Molding Sand and General Foundry Supplies

OF THE HIGHEST GRADE ONLY.



THE GARDEN CITY SAND CO.,

1201-1202-1203 Security Bldg., Chicago.

"Royal Star" and "Scioto Star"

High Grade FIRE BRICK.

Best for Rolling Mills, Blast Furnaces, Foundries, etc. High grade Plastic and Flint Clays for all refractory purposes at favorable prices.

The Scioto STAR Fire Brick Works.

PORTSMOUTH, OHIO.

Send for Catalogue

Established 1871.

Incorporated 1876.

...A B C OF IRON...

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to reduce cost of mixture. Steel, Physical Properties of Metals Defined. Statistics. Early History and Manufacture of Iron.

Former Price, $2.00. NOW $1.00.

Sent, postpaid, on receipt of price, by

THE IRON TRADE REVIEW CO.,

CHICAGO. CLEVELAND. PITTSBURG

A New Foundry Work.

THE CUPOLA FURNACE.

A Practical Treatise on the

Construction and Management of Foundry Cupolas,

Comprising the Best Methods of Construction and Management of Cupolas; Different Shaped Cupolas; Height of Cupolas; Placing Tuyeres; Lining; Spark Catching Devices; Blowers; Blast Pipes; Air Gauges; Charging; Directions for the Melting of Iron, Tin Plate Scrap and other Metals in Cupolas; Experiments in Melting; What a Cupola Will Melt, etc.

BY

EDWARD KIRK, PHILADELPHIA,

Practical Molder and Melter, Consulting Expert in Melting.

ILLUSTRATED BY SEVENTY-EIGHT ENGRAVINGS.

In One Volume, 8vo., 379 pages.

Price, $3.50.

Sent postpaid on receipt of price by

The Iron Trade Review Co.

27 Vincent St., Cleveland.

PETER GERLACH & CO.,

MAKERS OF

Saws, Tools and Machinery

Office and Warerooms, 28 Columbus St.
Factories on Columbus, Winter and Leonard Sts.

Cleveland, Ohio U. S. A.

A large and growing circulation among machine shop and foundry firms has

THE IRON TRADE REVIEW

BRÆBURN STEEL COMPANY, Bræburn, Pa.

MANUFACTURERS OF

FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

DIRECTORS: Wm. Metcalf, Chas. Metcalf, P. B. Hasbrouck, R. P. Kelly, Sec'y. and Treas.

CRESCENT STEEL

CRESCENT STEEL CO.

480 PEARL ST. NEW YORK — PITTSBURGH, PA. — 64 & 66 S. CLINTON ST. CHICAGO.

La BELLE STEEL CO., Pittsburgh, Pa.

MANUFACTURERS OF FINE

CRUCIBLE CAST TOOL STEEL.

SPECIAL GRADES FOR ALL PURPOSES.

BYRON H. WHITE,

Western Selling Agent.

OFFICE AND WAREHOUSE **68 and 70 South Canal St., Chicago.**

BYRON H. WHITE, Western Selling Agent,

68-70 South Canal St., Chicago.

MORRIS & BAILEY STEEL CO. PITTSBURG, PA.
FLAT & COILED FOR STAMPING BLANKING DRAWING SPRINGS ETC
COLD ROLLED STRIP STEEL
BYRON H WHITE

BYRON H. WHITE, Western Selling Agent CHICAGO.

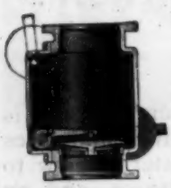
MONONGAHELA IRON & STEEL CO.,

Manufacturers of

Charcoal Bar Iron **CARTER BRANDS** Charcoal Iron Chain

All Sizes

United States Government Specifications Guaranteed. PITTSBURGH, PA.



Excelsior Straight-Way Back Pressure Valve

This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

JENKINS BROTHERS, NEW YORK, PHILADELPHIA, BOSTON, CHICAGO.

Dixon's Pure Flake Graphite

Is a Blessing to Every Engine Room and Machine Shop.

A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture.

Pamphlet and Sample Sent Free.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

Between the Lakes and the Gulf, the Mississippi and the Allegheny Mountains—the best buying section of the United States—is the BULK of THE IRON TRADE REVIEW'S circulation. In this section advertisers in all trade papers get best returns.

Persistent Advertising.

One who watches carefully the pages of general advertising mediums is struck by two things: the persistency with which those advertisers who are recognized as successful maintain their advertising week after week, month after month, and year after year; they never seem to abate their effort, and apparently the volume of their business increases steadily. The other thing noticeable is the large number or advertisers who thrust their announcements above the surface for a little while and then sink into oblivion. They either had not merit as a basis for their claims or they did not possess the skill to steer their enterprise successfully, or else they lacked the nerve to put forth proper effort.—[Advertising Experience.

"Metallurgy of Cast Iron,"

Price $3.

"The Alpha and Omega of the pressed steel car," writes the General Superintendent of a great American railroad, "is that it admits of a maximum of revenue-bearing tonnage being hauled with a minimum of dead weight." . . . THAT IS WHAT IT IS BUILT FOR.

PRESSED STEEL CAR COMPANY.

PITTSBURGH. NEW YORK. CHICAGO. PHILADELPHIA. JOLIET.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

FORSYTH PATTERN WORKS. Youngstown, Ohio.

MACHINE AND ARCHITECTURAL PATTERNS OF ALL DESCRIPTIONS.

Gear Work a Specialty.

Patterns for Castings from ¼ pound to 50 tons. Send on your Drawings and get prices.

SOLID SHEAR KNIVES

SAMUEL TRETHEWEY & CO. LTD.

PITTSBURG, PA.

ESTABLISHED 1883

BRASS FOUNDERS FINISHERS J. J. RYAN & CO.

6874 West Monroe St., Chicago.

Best Bronze, Babbitt Metals, Brass and Aluminum CASTINGS On Short Notice.

RAWHIDE BELTING

And Lace Leather.

— ALSO —

Rawhide Rope, Pinions, Picker Leather, Halters, Bell and Register Cord, and other Rawhide Goods of all kinds.

THE MABBS HYDRAULIC RAWHIDE PACKING.

CHICAGO RAWHIDE MFG. CO., 75-77 Ohio St., CHICAGO, ILL.

THE 1898 EDITION OF THE

Iron and Steel Directory

Published by The American Iron and Steel Association.

Will be sent postpaid by *The Iron Trade Review* at $7. Ready now.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works, with many new lists of works in other lines.

J. M. ALLEN, President.

WM. B. FRANKLIN, Vice-President.

F. B. ALLEN, Second Vice-President.

J. B. PIERCE, Secretary and Treas.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

BURWELL & BRIGGS, General Agents, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

C. A. BURWELL, Chief Inspector, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

J. E. WOLCOTT, Special Agent, 32 and 33 Clark Bldg., 208 Superior St., Cleveland, O.

FOR ARTISTIC PRINTING WRITE THE CLEVELAND PRINTING & PUBLISHING CO., CLEVELAND, O.

THE CENTRAL ELECTROTYPE AND ENGRAVING CO. 263-271 St. Clair St. Cleveland, O. GOOD ENGRAVING ELECTROTYPING

A large and growing circulation among machine shop and foundry firms, has

THE IRON TRADE REVIEW

NATIONAL TUBE COMPANY,

Manufacturers of

BLACK and GALVANIZED
Wrought Merchant Pipe, all kinds: sizes 1-8-inch to 30-inch, fitted in any manner desired.

BOILER TUBES,
Mild Steel and Charcoal Iron, for Stationary, Locomotive and Marine Work.

CASING, TUBING
and Drive Pipe for Well Purposes.

GAS AND OIL LINE PIPE.

CYLINDERS,
Lap-Welded and Seamless, tested from 100 to 3,700 lbs., for Compressed Air, Carbonic Acid Gas, Anhydrous Ammonia, etc., etc., etc.

WATER and GAS MAINS,
Converse and Matheson Lead Joint Pipe, 2-inch to 30-inch.

SEAMLESS
Tubes, Shrapnel, Projectiles and Miscellaneous Forgings.

Office of President and Treasurer, Havemeyer Bldg., NEW YORK CITY.

Office of Mercantile and Manufacturing Departments, Conestoga Bldg., PITTSBURG, PA.

LOCAL SALES OFFICES:

Havemeyer Building, NEW YORK CITY. 70 Federal St., BOSTON.
267 S. 4th St., PHILADELPHIA.
Fidelity Building, PITTSBURG. Western Union Building, CHICAGO.

Foreign Office: Dock House, Billiter Street, LONDON. Telegraphic Address: TUBULIFORM, LONDON.

National Steel Company

CHICAGO, ILL.

Manufacturers of

Bessemer and Open-Hearth Billets

Sheet and Tin Plate Bars.

THE CASTING AND CONVEYING OF METAL

Exhibit showing furnaces where the UEHLING METHOD has been adopted.

Location.	Stacks.	Daily Capacity. Tons.	Style Machine.
National Tube Works Company, McKeesport, Pa.	2	600	Double.
Carnegie Steel Company, Ltd., Duquesne, Pa.	4	2,400	Double.
Carnegie Steel Company, Ltd., Edgar Thompson	9	3,500	Six.
Carnegie Steel Company, Ltd., Rankin (Carrie)	2	700	Double.
Carnegie Steel Company, Ltd., Pittsburg (Lucy)	2	800	Double.
Struthers Furnace Company, Struthers, O.	1	300	Single.
Laughlin & Co., Ltd., Pittsburg, Pa. (Eliza)	5	2,000	Double (2).
Oliver & Snyder Steel Company, Pittsburg, Pa. (Edith)	1	400	Double.
Oliver & Snyder Steel Company, New Castle, Pa. (Rosena)	1	500	Double.
Shenango Valley Steel Company, New Castle, Pa.	2	800	Double.
Bellaire Steel Company, Bellaire, O.	2	700	Double.
Lebanon Furnaces, Lebanon, O.	2	500	Double.
Tennessee Coal, Iron & Railroad Company, Ensley, Ala.	4	800	Double.
Riverside Iron Works, Wheeling, W. Va	2	700	Double.
American Steel & Wire Co.	7	3,000	Double (3).
Totals	46	17,700	

For particulars write

G. H. GINTHER, Special Agent, Carnegie Bldg., Pittsburg, Pa.

BY THE

Uehling Method

is covered by U. S. patents Nos. 548,146, 629,480 and 632,031, which are fundamental, and others are pending.

The use of the Uehling Method at the furnaces mentioned has shown reduced labor cost, while SANDLESS IRON has proved a great advantage to the consumer.

AMERICAN STEEL AND WIRE CO.

CHICAGO. NEW YORK. SAN FRANCISCO.

FOR RAILROAD USE WE MAKE

Woven Wire Railroad Fences.

The "AMERICAN," "ELLWOOD" and "McMULLEN" RAILROAD FENCES.

High Carbon Steel Wires woven together so as to provide amply for expansion and contraction.

Thoroughly galvanized so as to secure length of life. ABSOLUTELY the BEST and CHEAPEST RAILROAD RIGHT-OF-WAY FENCES. Write for Catalogue.

We take contracts for the erection of Railway Right-of-way Fences anywhere in the world, having our own experienced employes, our own trains and equipment, for doing this class of work in the best and cheapest manner.

ELECTRICAL WIRES.

Galvanized Iron and steel Telegraph Wires made in accordance with W. U. and Postal Telegraph Companies' most rigid specifications.

Copper Wires and Cables of all kinds.

Insulated Wires and Cables for every purpose.

Lead encased Wires and Cables of all sizes for underground work.

Copper Rail Bonds—acknowledged the best wherever used.

Copper Trolley Wires.

WIRE ROPE.

Iron and Steel Wire Rope for all purposes.
Galvanized Guy Ropes.
Galvanized Steel Signal Strand.
Locomotive Switching Ropes, complete.
Plow Steel and Crucible Cast Steel Hoisting Ropes.
Ballast Unloader Cables fitted complete.
Transmission Rope.
Cableways for Mines, Quarries, or Excavating work of all kinds.
Suspension Bridge Cables.

SPRINGS.

Flat and Coiled Wire Springs of every size and for every purpose made in accordance with specifications in every detail.

CAR TRUCK SPRINGS. TROLLEY SPRINGS.
CAR SEAT SPRINGS. BUNK SPRINGS.
BRAKE SPRINGS.

Any desired temper. Any desired grade of Steel.

SHAFTING.

Cold-drawn Steel Shafting, any size, highest quality, lathe-cut or saw-cut ends, guaranteed perfect. Rounds, Squares, Hexagons, Flats or odd shapes.

Wire Nails. Spikes. Pole Steps. Tacks. Rivets. Staples. Lightest and Best Barb Wires.

NOTE OUR "DIFFERENTIALS."

We make our own steel, and accurately fulfill all specifications as to exact quality. We are able to guarantee quality by our own personal and intimate knowledge of our Steel. We are in position to see that you get just what you want for your "different" or special needs, depending for exact knowledge on none but our own works.

Jones & Laughlins, Ltd.,

AMERICAN IRON AND STEEL WORKS,

PITTSBURGH.

Branch House, Chicago, Ill. Branch Office, 220 Broadway, New York.

PLATES, TANK / SHIP } QUALITY.

Thickness ⅛-in. to 1-in.; Widths up to 90-in. Inquiries Solicited. Prompt Shipments.

CHAMPION IRON & STEEL COMPANY

MANUFACTURERS OF

Open Hearth Ingots, Billets and Bars,
Merchant Bar Iron and Bar Steel.

Also Buyers of

WROUGHT IRON AND STEEL SCRAP.

Muskegon, Mich.

Solicit correspondence.

American Steel Hoop Company,

General Offices: PITTSBURG.

MANUFACTURERS

Steel Hoops
Steel Bands
Cotton Ties
Steel Bars
Special Shapes
Angles
Channels
Small Tee Rails
Bar Iron
Pig Iron
Open Hearth Steel

District Sales Offices:

New York	Chicago	St. Paul
Empire Building	Marquette Building	Endicott Building
Boston	St. Louis	San Francisco
8 Oliver Street	Fullerton Building	23 Davis Street

WEST AND SOUTH

run the lines of the Illinois Central Railroad and the Yazoo & Mississippi Valley Railroad, reaching into the eleven States of

South Dakota	Kentucky
Minnesota	Tennessee
Iowa	Arkansas
Wisconsin	Mississippi
Illinois	Indiana Louisiana

Presenting an unequaled territory for diversified industries, and possessing

Fine Sites for New Mills

Best of Freight Facilities,—Coal Fields,

Close Proximity to Distributing Centers

Intelligent Help of All Kinds,

Many Kinds of Raw Material.

To sound industries, substantial inducements will be given by many of the places concisely described in the pamphlet "100 Cities and Towns Wanting Industries." Write for a copy. Nearly all kinds of industries are wanted. Very liberal inducements are offered TEXTILE INDUSTRIES in the South by a number of good places. GEORGE C. POWER, Industrial Commissioner I. C. R. R. Co. Chicago

A large and growing circulation among machine shop and foundry firms has

THE IRON TRADE REVIEW.

REPUBLIC IRON & STEEL COMPANY,

General Offices: Stock Exchange Building, CHICAGO, ILLINOIS.

BAR IRON:	BAR STEEL:	PLATES
Common, Refined, and B.B. Iron,	Bessemer and Open Hearth,	and Angles, Turnbuckles, "T" Rails, 8 to 20 lbs.,
Flats, Rounds, Squares, Ovals, etc.	Flats, Rounds, Squares, Ovals,	Cold Rolled Steel, Cut Nails,
Chains and Rivet Iron,	Angles, Channels, Special Shapes,	SHEETS (Black and Galvanized),
Maud S. Horse Shoe Bar,	Round Edge Steel Tire,	Harrow Teeth, Bolts and Nuts,
Skelp Iron, etc.	Agricultural Shapes, etc.	R. R. SPIKES, Steel Fence Posts, Steel Whiffletrees, Cross Arm Braces, Pole Steps.

FOUNDRY, BESSEMER AND MILL PIG IRON.

DISTRICT SALES OFFICES:—
Ellicott Square, Buffalo, N. Y.; Manhattan Life Building, New York; Perry Payne Bldg., Cleveland, O. Mormod-Jaccard Bldg., St. Louis; Birmingham, Ala.; Cincinnati, O.; Endicott Arcade, St. Paul, Minn.

THE

LORAIN STEEL COMPANY,

Lorain, Ohio.

Rails, Blooms, Billets and Slabs.

American Tin Plate Company

MANUFACTURERS OF

Coke Tin Plates,
Charcoal Tin Plates,
High Grade Terne Plates,
Black Plates.

GENERAL OFFICES:
Battery Park Building,
NEW YORK CITY, N. Y.

Wants and Sales

For our subscribers and advertisers only, we will insert under this head advertisements of help wanted and situations wanted free of charge. The advertisements to be inserted in three consecutive issues and to consist of not more than six lines each. All other advertisements will be charged at regular card rates.

WANTED—Malleable foundry superintendent. Must have experience in general work and a knowledge of foundry chemistry.
Address Box 104 care IRON TRADE REVIEW.

WANTED — A mine surveyor and chemist. Steady position to the right man. Write Huron Iron Co., Crystal Falls, Mich.

Wanted—To correspond with a live pushing man who is capable of superintending the manufacture of plows and other implements. State experience, where employed and give references.
Opportunity, care IRON TRADE REVIEW.

Wanted—Position by a chemist of ten years practical experience. Iron, Steel or Metallurgical work preferred. Capable of burdening a furnace. Technical graduate. Best of references.
Stone, care IRON TRADE REVIEW.

Wanted—Two or three good, young, machine men; by machine manufacturing concern in Detroit, Sober and industrious men, only, need apply. Box 101, care IRON TRADE REVIEW.

Wanted—A first class salesman, one who has had large experience in bar iron and bar steel
Salesman, care IRON TRADE REVIEW.

Wanted—Foreman for smith shop, about twenty hands employed. Heavy Forgings. One accustomedto plate and structural work preferred.
Box 102, care IRON TRADE REVIEW.

Wanted—Ten machine and floor men; also ten molders. Only steady men need apply.
The Lloyd Booth Co., Youngstown, O.

Wanted — A thoroughly capable mechanical draughtsman and designer for temporary engagement with prospect of permanent position.
103, care IRON TRADE REVIEW.

Applications for position of chemist are invited by Ashland Iron & Steel Co., Ashland, Wis.

New and Relaying Rails
FOR SALE.

400 tons 25-lb. Steel Relaying Rails with splices, in Michigan.

50-lb., 60-lb., 65-lb. Steel Relaying Rails with splices, in Pennsylvania.

New 25-lb. Steel Rails, immediate shipment.

300 tons practically new 40-lb. Iron Rails with angle splices, in Pennsylvania, subject to Hunt's inspection.

36-inch gauge Contractors' Cars and Locomotives.

HYDE BROS. & CO.,
Lewis Block, PITTSBURG.

FOR SALE OR LEASE.

Five thousand acres of fine mineral lands for sale or lease.

For particulars address

PIKE RIVER LAND CO.,
Tower, Minn. A. G. KINGSTON, Pres't

WE OWN—FOR SALE,
For Immediate Delivery.

1 Mundy 7 x 12 single cylinder, single drum Hoisting engine, with boiler
1 8 x 10 Atlas Automatic Engine.
2 Dean Duplex Pumps, 10 x 6 x 10.
1 No. 5 Nye Pump.
1 No. 8 Centrifugal Pump.
1 No. 6 Centrifugal Pump
1 Gardner Duplex Pump, 6 x 4 x 6.
1 Smith-Vaile Duplex Pump, 3 x 3 x 4.
1 Worthington Duplex Pump, 4½ x 2¾ x 4.
1 American Hoist, Double Gear Crab.

Our specialties are:
CARS,
LOCOMOTIVES,
STEAM SHOVELS.

Write us.

TORBERT & PECKHAM,
16th Floor. — — Monadnock, Chicago.

CASTINGS.

Having just added to our plant an excellently equipped foundry and having larger capacity than we ourselves will use, we solicit work in this department. We have facilities for producing most excellent

Gray Iron Castings

promptly and in any quantity. We will also contract to make stoves or other goods from jobbers' patterns.
Address

Detroit Galvanizing & Sheet Metal Works,
Detroit, Mich.

BEAMS, CHANNELS, ANGLES, ZEES, PLATES.

2000 Tons in Stock.

Eye Beams, 4 inch to 20 inch, inclusive.
Channels, 4 inch to 15 inch, "
Equal Angles, 1¼ x 1¼ to 6 x 6, "
Unequal " 2½ x 2 to 6 x 4, "
Plates, ¼ inch thick and over.
Zees, 3 in., 4 in., 5 in. and 6 in.

All material in 50 to 70 ft. lengths or cut to specified lengths when desired. Shipments promptly on receipt of order. Send for detail stock list.

THE FOREST CITY STEEL & IRON CO.,
Cleveland. O.

WANTED

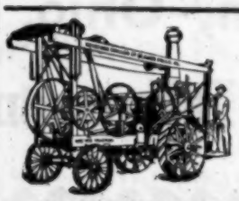
Bright young man, about 25, to sell iron ore. One well acquainted with furnaces, and their requirements, desired.

Address BOX 25,
care IRON TRADE REVIEW,
Cleveland, O.

FOR RENT OR SALE.

The Axle Works property No. 694 Broadway at Junction of Broadway, Erie and Cleveland Terminal & Valley railway, Cleveland, O., including engine, boiler and shafting; or will erect on these premises buildings to suit tenant, if leased for a term of years. Address

CLEVELAND AXLE MFG. CO.,
Canton, O.
ESTABLISHED 1854.



FOR TESTING IRON ORE BODIES

or drilling deep test holes in ANY formation—gravel, boulders and rock. Drives 4, 6, 8 or 10-inch pipe, or drills holes that size in rock, and

PRODUCES AT THE SURFACE EVERYTHING FOUND.

Tests for gold, lead, zinc, coal—everything. Can be used on boat, to explore river beds to bed rock. Water no hindrance. Drills water and oil wells quickly, cheaply and without skilled labor. Self-moving; complete.
Write for full information and catalogue.

THE KEYSTONE DRILLER CO.,
BEAVER FALLS, PA., U. S. A.

FOR IMMEDIATE DELIVERY

ANGLES, BEAMS, CHANNELS, PLATES, TEES, ZEES, BARS.

Cut to specified sizes.

5,000 tons in stock. Moderate prices. Send for stock sheet and quotations.

Structnral Department.
ILLINOIS STEEL CO.,
Designers, Manufacturers and Erectors of Structural Iron Work. Dealers in Structural Materials.
50 Wabansia Ave, CHICAGO.

FOR SALE—MACHINERY.

Shaper, 17 in., Smith & Mills.
Planer, 44 x 44 x 22 ft. bed with 22 ft. extension.
Large Tire Bender.
Punch, Long & Allstatter's No. 1 heavy.
35 in. Buffalo Fan.
Drop Hammer, Williams & White, No. 5.
Roller Wedger, Power for tires.
Bradley Hammers, 25 lbs.
National Bolt Header.
Scarfing Machine.
4 Cast Iron Forges complete.
2 Large Oil Tanks.
Wire Straightener and cut-off, Adt's Patent Automatic. ¼ cut to 4 ft.
Dynamo, Triumph, 150 light.
Also other miscellaneous machinery, all in first class condition and formerly used by a Metal Wheel Works.

Address 716 East Third St., Cincinnati, O.

FOR SALE.

70 pieces only
SEAMLESS STEEL TUBING
3¼ in. O. D. x 3 in. I. D., 12 ft. lengths. Carbon .25%.

GLASGOW IRON WORKS,
29 West St., New York, N. Y.

Wanted.

Iron Mill Buildings.
State dimensions, location and price

W. M. Hamilton,
Park Building, PITTSBURGH, PA.

FOR SALE.

A MODERN COKE BLAST FURNACE PROPERTY . .

with 70 acres of land in Central New York, also 150 acres of valuable Ore Rights and Mines near the Furnace at Kirkland, Oneida County, N. Y., on the N. Y., Ontario & Western and West Shore Railroads and near the N. Y. Central Railroad and its branches, North and South, also Delaware, Lack. & Western and Lehigh Valley Railroads and Erie Canal. Apply to

I. A. WILLIAMS,
11 Blandina St., Utica, N. Y

FOR SALE.

Nail Mill, located within fifteen miles of St. Louis, and in the midst of Coal Shafts, fully equipped to make cut nails of all sizes, at short notice. Capacity 800 kegs per day.
Address

SEDDON & BLAIR,
Union Trust Building, ST. LOUIS, MO.

Business For Sale.

Through the rapid growth and constantly increasing demand for space of the other departments of our business, we are compelled to offer for sale our gas and gasoline engine business.

We sold during the past calendar year over 125 engines, averaging between 10 and 20 H. P., and ranging in size from 3 H. P. to 50 H. P.

Included in our offer are all drawings patterns, patents, jigs, templates, special tools, finished and unfinished stock, and also about 60 engines ready for immediate delivery.

The business is thoroughly organized and can be continued without interruption. Parties having the necessary capital will be offered the fullest opportunity for investigation upon satisfactory proof of their sincerity.

Address all replies to "E. E. S.,"
Care of IRON TRADE REVIEW.

PAY-ROLL FIGURING

Is EASY and SURE with the **Ellis Wage Scale Board**, which gives instantly wages for any number of hours from 5 minutes to three months at any rate of wages paid and without any figuring. Have boards figured for 48, 50, 51, 52, 53, 54 55, 56, 57, 58, 59, 60 and 66 hour weeks. Is on 3 ply veneer, size 12x24. Price $2.00 express prepaid. Send for one today.

ELLIS MFG. CO.,
277 So East St., GRAND RAPIDS, MICH.

Locations for Industries.

The name of the Chicago, Milwaukee & St. Paul Railway has long been identified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company s lines.

The Chicago, Milwaukee & St. Paul Railway Company's 6,300 miles of railway, exclusive of second track, connecting track or sidings, traverses eight states, namely:

NORTH DAKOTA	MINNESOTA	NORTHERN MICHIGAN
SOUTH DAKOTA	IOWA	WISCONSIN
Express Passenger Trains Fast Freight Trains Throughout.	MISSOURI	ILLINOIS

which comprise a great Agricultural, Manufacturing and Mining territory.

The Chicago, Milwaukee & St. Paul Railway Company gives unremitting attention to the development of local traffic on its lines and, with this in view, seeks to increase the number of manufacturing plants on its system either through their creation by local enterprise or the influx of manufacturers from the East. It has all its territory districted in relation to resources, adaptability and advantages for manufacturing. Specific information furnished manufacturers in regard to suitable locations. Address,

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y.
Old Colony Building, Chicago, Ill.

AETNA & CORLISS ROLLING MILL ENGINES
THE TOTTEN & HOGG IRON & STEEL FOUNDRY CO.
OFFICE & WORKS
24TH ST. & A.V.R.R.
PITTSBURGH, PA.
PINIONS, CHILLED & SAND ROLLS.
ROCK CRUSHERS
ROLLING MILL & TIN PLATE MILL MACHINERY

THE LLOYD BOOTH CO.

YOUNGSTOWN, O.

Manufacturers of
IRON AND STEEL WORKS MACHINERY.

THE LORAIN FOUNDRY COMPANY,

Lorain, Ohio.

SAND AND CHILLED ROLLS.

Heavy Iron Castings in Loam, Dry and Green Sand,
Made from Cupola or Air Furnace...

BRASS AND COPPER CASTINGS.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case B'l'g.

CLEVELAND, O.

Order direct from
The IRON CLAD PAINT CO
and get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

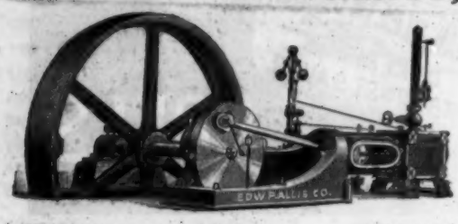
Iron Clad Paint

is the
MOST DURABLE,
MOST FIRE-PROOF
and CHEAPEST PAINT made.

Furnished both Dry and Ground in Oil.
Used by nearly all the Railroads.

THE EDWARD P. ALLIS CO.

Milwaukee, Wis.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting, Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills, Concentrators, General Mining, Milling and Smelting Machinery.

REYNOLDS CORLISS ENGINES.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE.
CITY OF MEXICO. SAN FRANCISCO. PITTSBURG.

Southwark Foundry & Machine Co.

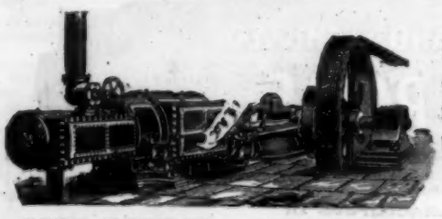
PHILADELPHIA, PA.

Porter-Allen Automatic Engines,
Blowing Engines, Centrifugal Pumps,
Weiss Counter-Current Condensers.

William Tod & Co.

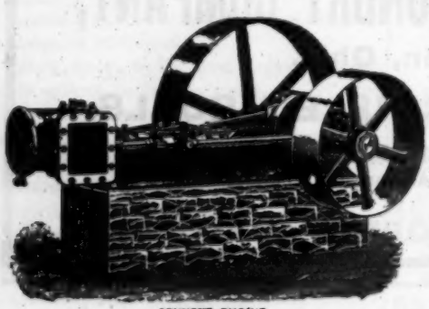
YOUNGSTOWN, OHIO.

The PORTER-HAMILTON ENGINE.



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

PARK BUILDING, PITTSBURG, - - Seward S. Babbitt.



SENNETT ENGINE.

THE GEO. B. SENNETT CO.,

YOUNGSTOWN, OHIO,

MANUFACTURERS OF THE

Sennett Slide Valve Engine.

A well made and durable center crank engine of from 20 to 40 h. p. The design is thoroughly modern and all parts are made in duplicate. Engines kept in stock ready to run. Catalogues or prices willingly furnished. Among our other specialties are the

Sennett Compressed Couplings.

(See advertisement next week.)

Foundry contracts solicited for Castings from 10 lbs. to 5 tons each.

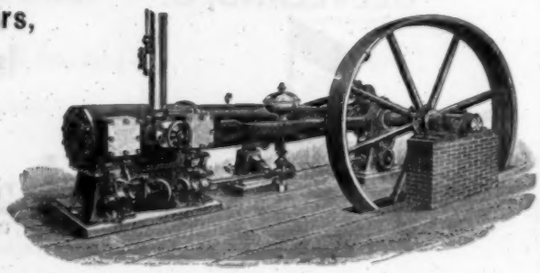
THE I. & E. GREENWALD CO.

Engineers, Founders, and Machinists.

Steam Engines, Shafting, Hangers, Pulleys, Sprocket Wheels, Chains, Etc.

Headquarters for Mill Gearing of all kinds and sizes Steam power plants complete

720 East Pearl St.,
CINCINNATI. OHIO.



BUYERS' DIRECTORY.

AGRICULTURAL SHAPES—
Republic Iron & Steel Co., Chicago, Ill.
Champion Iron & Steel Co., Muskegon, Mich.

AIR COMPRESSORS—
Edw. P. Allis Co., Milwaukee, Wis.
Fraser & Chalmers, Chicago, Ill.
Rand Drill Co., Chicago, Ill.
Clayton Air Compressor Works, New York.
Ingersoll-Sergeant Drill Co., New York.
Hall Steam Pump Co., Pittsburg, Pa.
Manning, Maxwell & Moore, New York City.
W. J. Schaefer & Co., New York City.

AIR HOISTS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill
Manning, Maxwell & Moore, New York City.

AIR LIFT PUMPS—
Clayton Air Compressor Works, New York.
The Ingersoll-Sergeant Drill Co., New York.

ANALYTICAL CHEMISTS—
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O
The Robert W. Hunt & Co., Chicago, Ill.
John T. Jones & Co., Chicago, Ill.
Cremer & Bicknell, Cleveland, O.

ANGLES—
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.

ANNEALING BOXES—
Meehan Boiler & Construction Co., Lowellville, Ohio.
Wm. B. Pollock Co., Youngstown, O.

ANTI-FRICTION METAL—
Theo. Hiertz & Son, St. Louis, Mo.
Magnolia Metal Co., New York City.
C. H. Besly & Co., Chicago, Ill.
Wm. Cramp & Sons, Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.

AXLES—
Bethlehem Steel Co., So. Bethlehem, Pa.

BABBITT METAL—
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Magnolia Metal Co., New York City.
James B. Clow & Sons, Chicago, Ill.
Lorain Foundry Co., Lorain, O.
J. J. Ryan & Co., Chicago, Ill.

BALLS—
Cleveland Ball & Screw Co., Cleveland, O.

BAR IRON AND STEEL—
Monongahela Iron & Steel Co., Pittsburg, Pa.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Bourne-Fuller Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ills.
American Steel Hoop Co., Pittsburg, Pa.
Champion Iron & Steel Co., Muskegon, Mich.

BEARING METAL—
Magnolia Metal Co., New York City.
Theo. Hiertz & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.

BELTING—
C. H. Besly & Co., Chicago, Ill.
The Chicago Rawhide Mfg. Co., Chicago, Ill.
The Gandy Belting Co., Baltimore Md.
Main Belting Co., Philadelphia, Pa.
The Jeffrey Mfg. Co., Columbus, O.

BELT LACING—
The Bristol Co., Waterbury, Conn.

BLACKSMITH AND CARRIAGE SUPPLIES—
C. H. Besly & Co., Chicago, Ill.

BLAST FURNACE MACHINERY—
Excelsior Iron Works Co., Cleveland, O.

BLAST FURNACE WORK—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
The United Boiler Co., Girard, O.

BLOWING ENGINES—
Southwark Foundry & Machine Co., Philadelphia, Pa.
Edward P. Allis Co., Milwaukee, Wis.

BOILERS AND BOILER ATTACHMENTS—
Hyde Bros. & Co., Pittsburg, Pa.
The Wm. B. Pollock Co., Youngstown, O.
Cahall Sales Department, Pittsburg, Pa.
Enterprise Boiler Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
Hooven, Owens & Rentschler Co., Hamilton, O.
Harrison Safety Boiler Works Philadelphia.
Meehan Boiler & ConstructionCo., Lowellville, O
Wm. Cramp & Sons, Philadelphia, Pa.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Excelsior Iron Works Co., Cleveland, O.
James Bonar & Co., Pittsburgh, Pa.
W. P. Davis Machine Co., Rochester, N. Y.
The United Boiler Co., Girard, O.

BOILER CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

BOILER COVERING—
C. H. Besly & Co,, Chicago, Ill.

BOLIER COMPOUNDS—
The Ironsides Company, Columbus, O.

BUYERS' DIRECTORY.

BOILER TUBES—
S. Fix Sons, Cleveland, O.
National Tube Co., Pittsburg, Pa.

BOILER TUBE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa

BOLTS AND NUTS—
L. K. Hirsch, Chicago, Ill.
Upson Nut Co., Cleveland, O.

BOLT CUTTERS—
American Tool Works Co., Cincinnati, O.

BORING AND TURNING MILLS—
H. Bickford, Lakeport, N. H.
U. Baird Machinery Co., Pittsburg, Pa.
Baush & Harris Machine Tool Co., Springfield, Mass.
Bickford Drill and Tool Co., Cincinnati, O.
Universal Construction Co., Chicago, Ill.
American Tool Works Co., Cincinnati, O.

BOX CAR UNLOADER—
The Jeffrey Mfg. Co., Columbus, O.

BRASS CASTINGS—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

BRIDGES—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Shiffler Bridge Co., Pittsburg.

BUILDINGS (STEEL FRAME)—
Illinois Steel Co., Chicago, Ill.
Wm. B. Scaife & Sons, Pittsburg, Pa.
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

BUCKETS AND DERRICKS—
Excelsior Iron Works Co., Cleveland, O.

CABLEWAYS—
Lidgewood Mfg. Co., New York City.
Waterbury Rope Co., New York City.

CARS—
L. K. Hirsch, Chicago, Ill.
The Pressed Steel Car Co., Pittsburg, Pa.

CAR UNLOADERS—
Excelsior Iron Works Co., Cleveland, O.

CAR WHEEL FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

CARRYING TONGS—
Vulcan Mfg. Co., Pittsburg, Pa.

CASE HARDENING MATERIALS—
American Carburizing Co., New York City.

CASTINGS—
Seaman-Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
Macbeth & Co., Cleveland, O.
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Schuylkill Iron & Steel Co., Philadelphia, Pa.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W.Va.
Lorain Foundry Co., Lorain, O.

CASTINGS (ALUMINUM)
J. J. Ryan & Co., Chicago, Ill.

CASTINGS (BRASS)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co Lorain. O.

CASTINGS (BRONZE)—
J. J. Ryan & Co., Chicago, Ill.
Lorain Foundry Co., Lorain, O.

CASTINGS (MALLEABLE)—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.

CASTINGS (Steel)—
Hercules Steel Casting Co., Harvey, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.

CEMENT—
Garden City Sand Co., Chicago, Ill.
Reed F. Blair & Co., Pittsburg, Pa.

CHAIN BELTING—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
The Aultman Co., Canton, O.
Buhl Malleable Co., Detroit, Mich.

CHANNELERS—
The Ingersoll-Sergeant Drill Co., New York.

CHEMISTS—
F. A. Emmerton, Cleveland, O.
O. Textor, Cleveland, O.
The R. W. Hunt & Co., Chicago, Ill.
John T. Jones & Co., Chicago, Ill.
Cremer & Bicknell, Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
We Fu Go Co. Cincinnati, O.

CHILLED AND SAND ROLLS—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Riverside Foundry Co., Cleveland, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Lorain Foundry Co., Lorain, O.
The Lloyd Booth Co., Youngstown, O.

COAL CUTTERS—
The Ingersoll-Sergeant Drill Co., New York.
Jeffrey Mfg. Co., Columbus, O.

COAL SCREENS—
Hendrick Mfg. Co., Carbondale, Pa.
Rob't. Aitchinson Per. Metal Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

COAL AND COKE—
M. A. Hanna & Co., Cleveland, O.
Rogers, Brown & Co., Cincinnati, O
Reed F. Blair & Co., Pittsburg, Pa.
Pickand, Brown & Co., Chicago, Ill.
H. C. Frick Coke Co., Pittsburg, Pa.
McKeefrey & Co., Leetonia, O.
Pickands, Mather & Co., Cleveland, O.
J. H. Hillman & Son, Pittsburg, Pa.

COAL MINING MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
Webster Camp & Lane Machine Co., Akron, O.

COMPAROMETERS—
Vulcan Mfg. Co., Pittsburg, Pa.

COMPRESSED AIR SHOP TOOLS—
Clayton Air Compressor Works, New York City.
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
Q & C Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
W. J. Schaefer & Co., New York City.

COMPRESSION COUPLINGS—
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

CONTRACTORS FOR CLEANING BOILERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

CONVEYORS—
Jeffrey Mfg. Co., Columbus, O.
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago Ill.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.

CORRUGATED IRON—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Cincinnati Corrugating Co., Piqua, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

COTTON TIES—
American Steel Hoop Co., Pittsburg, Pa.

CRANES—
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Northern Engineering Works, Detroit, Mich.
Wm. Tod & Co., Youngstown, O.
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
Whiting Foundry Equipment Co., Harvey, Ill.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
Excelsior Iron Works Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Crane & Car Co., Cleveland, O.

CRANK PINS—
Bethlehem Steel Co., S. Bethlehem, Pa.

CUPOLAS—
Riter-Conley Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co, Harvey, Ill.
The United Boiler Co., Girard, O.
Wm. B. Pollock Co., Youngstown, O.

CUTTER AND REAMING GRINDERS—
American Tool Works Co., Cincinnati, O.

DIES—
Mossberg & Granville Mfg. Co., Providence, R. I.
Danielson Machine & Tool Co., Cleveland, O.

DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
The Jeffrey Mfg. Co., Columbus, O.

DRILL GRINDERS—
J. Wendell Cole Columbus, O.

DRILLING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

DRILL PRESSES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Manning, Maxwell & Moore, New York City.
Danielson Machine & Tool Co., Cleveland, O.

DROP FORGINGS—
Wyman & Gordon, Worcester, Mass.
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Jas. H. Baker Mfg. Co., Pittsburg, Pa.

DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield, Mass.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.

DROP PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
E. Konigslow & Bro., Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
Cleveland Punch & Shear Wks. Co., Cleveland, O.

DYNAMOS—
Jeffrey Mfg. Co., Columbus, O.

EAVE TROUGHS AND CONDUCTORS—
Berger Mfg. Co., Canton, O.

ELEVATORS—
Whiting Foundry Equipment Co., Harvey, Ill.

ELEVATING AND CONVEYING MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster Camp & Lane Machine Co., Akron, O.
Buhl Malleable Co., Detroit, Mich.
Excelsior Iron Works Co., Cleveland, O.

EMERY AND CORUNDUM WHEELS—
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besley & Co, Chicago, Ill.
J. Wendell Cole, Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

EMERY WHEEL MACHINERY—
J Wendell Cole, M.E., Columbus, O., or Chicago
Star Corundum Wheel Co., Detroit, Mich.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago, Ill.
W. P. Davis Machine Co., Rochester, N. Y.

ENGINEERS AND CONTRACTORS—
Wellman-Seaver Engineering Co., Cleveland, O.
Walter Kennedy, Pittsburg, Pa.
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville, O
E. E. Erickson, Pittsburg, Pa.
John T. Jones & Co., Chicago, Ill.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Julian Kennedy, Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

ENGINE PACKING—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

ENGINEERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

ENGINE LATHES—
U. Baird Machinery Co., Pittsburg, Pa.
American Tool Works Co., Cincinnati, O.

ENGINES (OIL)—
The Aultman Co., Canton, O.

ENGINES STEAM)—
W. P. Davis Machine Co., Rochester, N. Y
Wm. Tod & Co., Youngstown, O.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.

ENGRAVERS AND ELECTROTYPERS—
Central Electrotype & Engraving Co., Cleveland.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

FEED WATER HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

FELLOE PLATES—
Avery Stamping Co., Cleveland, O.

FILES, MAKERS OF—
C. H. Besly & Co., Chicago, Ill.

FILTERS—
Wm. B. Scaife & Sons, Pittsburg, Pa.

FIRE BRICK AND CLAY—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield Pa.
Dover Fire Brick Co., Cleveland, O.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
A. F. Smith & Co., New Brighton, Pa.
Chas Taylor's Sons Co. Cincinnati, O.

FIRE PROOF COVERING—
C. H. Besly & Co., Chicago, Ill.

FLEXIBLE SHAFTS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FLUE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

FOOT AND POWER LATHES—
U. Baird Machinery Co., Pittsburg, Pa.

FORGINGS—
Chicago Drop Forge & Foundry Co., Kensington, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Steel Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Samuel Trethewey & Co., Pittsburg, Pa.
Jas H. Baker Mfg. Co., Pittsburg, Pa.
Joseph Dyson & Sons, Cleveland, O.

FOUNDRIES—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Schuylkill Iron & Steel Co., Philadelphia, Pa.
Riverside Foundry Co., Cleveland, O.
I. & R. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W.Va.
Excelsior Iron Works Co., Cleveland, O.
Macbeth & Co., Cleveland, O.
Vulcan Foundry & Machine Co., New Castle, Pa

FOUNDRY EQUIPMENT.
Tabor Mfg. Co., Elizabeth, N. J.
Brass Founders Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Northern Engineering Works, Detroit, Mich.
Cleveland Crane & Car Co., Cleveland, O.
Whiting Foundry Equipment Co., Harvey, Ill.
Thos. Furlow & Son, Philadelphia, Pa.

FOUNDRY FACINGS—
Cleveland Facing Mill Co., Cleveland, O.

FOUNDRY SUPPLIES—
Northern Engineering Works, Detroit, Mich.
Chas. Taylor's Sons Co., Cincinnati, O.
Clearfield Fire Brick Co., Clearfield, Pa.
Cleveland Crane & Car Co., Cleveland, O.

Thos. Furlow & Son, Philadelphia, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. P. Smith & Co., New Brighton
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
Cleveland Facing Mill Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

FRICTION METAL—
James B. Clow & Sons, Chicago, Ill.
Theo. Hierts & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Magnolia Metal Co., New York City.
Perfect Lubricating Metal Co., Cincinnati, O.
J. J. Ryan & Co., Chicago, Ill.

FURNACE LININGS—
Union Mining Co., Mt. Savage, Md.

FURNACE, MELTING—
Whiting Foundry Equipment Co., Harvey, Ill.

FUEL OIL BURNERS—
W. S. Rockwell & Co., New York City.

GALVANIZED IRON—
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZERS—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

GALVANIZING POTS—
The Wm. B. Pollock Co., Youngstown, O.

GAS ENGINES—
Northern Engineering Works, Detroit, Mich.

GAUGE COCKS—
James Bonar & Co., Pittsburg, Pa.

GEARING—
I. & R. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

GEAR CUTTERS—
F. H. Bultman & Co., Cleveland, O.

GEAR CUTTING—
The R. D. Nuttall Co., Allegheny, Pa
The Van Dorn & Dutton Co., Cleveland, O.
F. H. Bultman & Co., Cleveland, O.

GEAR LUBRICANTS—
The Ironsides Company, Columbus, O.

GIRDER WORK—
Wm. B. Scaife & Sons, Pittsburg, Pa.

GRINDSTONES—
C. H. Besly & Co., Chicago, Ill.

GRAPHITE PAINT—
Jos Dixon Crucible Co., Jersey City, N. J.

GRATE BARS—
Geo. B. Sennett Co., Youngstown, Ohio.

GRAY IRON CASTINGS—
W. A. Jones Foundry Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.

HACK SAWS—
O & C Co., Chicago, Ill.
Cleveland Punch & Shear Wks. Co., Cleveland, O.

HANGERS—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & R. Greenwald Co., Cincinnati, O.

HARNESS SNAPS—
Covert Mfg. Co., West Troy, N. Y.

HEATERS AND PURIFIERS—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
Wefugo Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.
The United Boiler Co., Girard, O.

HEAVY HARDWARE—
C. H. Besly & Co., Chicago, Ill.

HOISTS—
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

HOISTING ENGINES—
The Edward P. Allis Co., Milwaukee, Wis.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittston, Pa.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O.

HOISTING MACHINERY—
Exeter Machine Works, Pittston, Pa.
Link-Belt Machinery Co., Chicago, Ill.
Jeffrey Mfg. Co., Columbus, O.
Excelsior Iron Works Co., Cleveland, O.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.

HORSE SHOES—
Phoenix Horse Shoe Co., Joliet, Ill.

IMPULSE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

INDUSTRIAL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

INGOT MOLDS—
Lorain Foundry Co., Lorain, O.

INJECTORS—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

INSURANCE COMPANIES—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.

IRON BUILDINGS—
Illinois Steel Co., Chicago, Ill.
Schiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON, NAILS AND STEEL—
C. H. Besly & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
L. K. Hirsch, Chicago, Ill.

IRON AND STEEL ROOFING—
Berger Mfg. Co., Canton, O.
Ætna Standard Iron & Steel Co., Bridgeport, O.
Cincinnati Corrugating Co., Piqua, O.
Wm. B. Scaife & Sons, Pittsburg, Pa.

IRON ORE—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.
J. Wesley Pullman, Philadelphia, Pa.
Tod, Stambaugh & Co., Cleveland, O.

IRON WORKING TOOLS—
Avery Stamping Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Armstrong Bros. Tool Co., Chicago, Ill.
American Machinery & Trading Co., N. Y. City.
F. H. Bultman & Co., Cleveland, O.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
W. P. Davis Machine Co., Rochester, N. Y.
Manning, Maxwell & Moore, New York City.
Bertsch & Co., Cambridge City, Ind.

LADLES—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
The United Boiler Co., Girard, O.
Wm. B. Pollock Co., Youngstown, O.

LATHES—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O.

LINK BELTING—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

LOCOMOTIVES—
L. K. Hirsch, Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.

MACHINISTS' TOOLS AND SUPPLIES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
American Machinery & Trading Co., N. Y. City.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Baush & Harris Machine Tool Co., Springfield Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
F. H. Bultman & Co., Cleveland, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.

MACHINE SCREWS—
C. H. Besly & Co., Chicago, Ill.

MACHINE SHOPS—
The R. D. Nuttall Co., Allegheny, Pa.
Danielson Machine & Tool Co., Cleveland, O.

MACHINERY AND TOOL STEEL—
C. H. Besley & Co., Chicago, Ill.
Braeburn Steel Co., Braeburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.

MAGNESIA COVERING—
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.

MALLEABLE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.

MALLEABLE CASTINGS—
Acme Malleable Iron Works, Buffalo, N. Y.
Buhl Malleable Co., Detroit, Mich.

MANUFACTURING CHEMISTS—
Wefugo Co., Cincinnati, O.
Grasselli Chemical Co., Cleveland, O.

MANUFACTURED IRON AND STEEL—
Bourne-Fuller & Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Champion Iron & Steel Co., Muskegon, Mich.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Cabeen Co., Philadelphia, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.

METAL BEARINGS—
Theo. Hierts & Son, St. Louis, Mo.
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Magnolia Metal Co., New York City.
Swarts Metal Refining Co., Chicago, Ills.
J. J. Ryan & Co., Chicago, Ill.

METAL CEILINGS—
Berger Manufacturing Co., Canton, O.

METAL WORK—
Avery Stamping Co., Cleveland, O.

MILL CASTINGS—
Vulcan Foundry & Machine Co., New Castle, Pa.
Schuykill Iron & Steel Co., Philadelphia, Pa.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

MINING MACHINERY—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Exeter Machine Works, Pittson, Pa.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Excelsior Iron Works Co., Cleveland, O.
Wm. B. Pollock Co., Youngstown, O.

MINE PUMPS—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

MOLDING MACHINES—
Tabor Mfg. Co., Elizabeth, N. J.
Whiting Foundry Equipment Co., Harvey, Ill.
Thos. Furlow & Son, Philadelphia, Pa.

MOLDING SAND—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

MULTIPLE DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.

NICKEL PLATING OUTFITS—
Northampton Emery Wheel Co., Chicago, Ill.

NUTS AND BOLTS—
Upson Nut Co., Cleveland, O.

OILLESS BEARINGS—
C. H. Besly & Co., Chicago, Ill.

OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL STORAGE TANKS—
Wm. B. Pollock Co., Youngstown, O.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.
American Tool Works Co., Cincinnati, O.

OIL TANKS AND CARS—
Wm. B. Pollock Co., Youngstown, O.

ORE CARS—
The Pressed Steel Co. Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers Chicago, Ill.

ORE SCREENS—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.

ORE TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.

PACKING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
James B. Clow & Sons, Chicago, Ill.

PAINT—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland, O.
Forsythe Pattern Works, Youngstown, O.

PERFORATED METALS—
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Hendrick Mfg. Co., Carbondale, Pa.

PIG IRON—
Cabeen Co., Philadelphia, Pa.
Rogers, Brown & Co., Cincinnati, O.
Reed F. Blair & Co., Pittsburg, Pa.
Clinton Iron & Steel Co., Pittsburg.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
Pickands, Brown & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
Hickman, Williams & Co., Chicago, Ill,
Pickands, Mather & Co., Cleveland, O.
Republic Iron & Steel Co., Chicago, Ill.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill,
J. H. Hillman & Son, Pittsburg, Pa.

PIG IRON CASTING APPARATUS—
Heyl & Patterson, Pittsburg, Pa.
G. H. Ginther, Special Agent, Pittsburg, Pa.

PIPE (CAST IRON)—
James B. Clow & Sons, Chicago, Ill.
PIPE (RIVETED STEEL)—
Wm. B. Scaife & Sons, Pittsburg, Pa.
Wm. B. Pollock Co., Youngstown, O.
PIPE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.
PIPE COVERING—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
PIPE CUTTING AND THREADING MACHINES—
The Armstrong Mfg. Co., Bridgeport, Conn
PIPE FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill.
PISTON RODS—
Bethlehem Steel Co., So. Bethlehem, Pa.
PLANERS—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
American Tool Works Co., Cincinnati, O
PLATES—
Enterprise Boiler Co., Youngstown, O.
Republic Iron & Steel Co., Chicago, Ill.
Illinois Steel Co., Chicago, Ill.
PLUMBERS' AND GAS FITTERS' SUPPLIES—
C. H. Besly & Co., Chicago, Ill.
James B. Clow & Sons, Chicago, Ill.
PNEUMATIC APPLIANCES—
Clayton Air Compressor Works, New York.
Q & C Co., Chicago, Ill.
W. J. Schaefer & Co., New York City.
PORTABLE FORGE—
C. H. Besly & Co., Chicago, Ill.
Vulcan Mfg. Co., Pittsburg, Pa.
POWER DROP HAMMERS—
Baush & Harris Machine Tool Co., Springfield Mass.
Mossberg & Granville Mfg. Co., Providence, R.I.
American Machinery & Trading Co., N. Y. City.
POWER PRESSES—
Avery Stamping Co., Cleveland, O.
Bertsch & Co., Cambridge City, Ind.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
POWER TRANSMISSON MACHINERY—
Jeffrey Mfg. Co., Columbus, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
PRESSES—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Avery Stamping Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
PRESSURE GAUGES—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.
PULLEYS—
W. A. Jones Foundry Co., Chicago, Ill
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
PUMPS (STEAM)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill,
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.
Southwark Foundry & Machine Co., Philadelphia, Pa.
PUNCHES—
E. Konigslow & Bro. Cleveland, O.
PYROMETERS—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.
RADIAL DRILLS—
Bickford Drill and Tool Co., Cincinnati, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
American Tool Works Co., Cincinnati, O.
RAILS—
L. K. Hirsch, Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.
RAILWAY SUPPLIES—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
L. K. Hirsch, Chicago, Ill.
RELAYING RAILS—
L. K. Hirsch, Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.
RIVETS—
Champion Rivet Co., Cleveland, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
RIVETED STEEL PIPE—
The Wm. B. Pollock Co. Youngstown, O.
ROCK DRILLS—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.
ROLL FORGINGS—
Samuel Trethewey & Co., Pittsburg, Pa.
ROLLER BEARINGS—
Mossberg & Granville Mfg. Co., Providence, R.I.
ROLLING MILLS—
Mossberg & Granville Mfg. Co., Providence, R.I.

ROLLING MILL MACHINERY—
The United Boiler Co., Girard, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. B. Phillips' Sons Co., Philadelphia, Pa
Whiting Foundry Equipment Co., Harvey, Ill.
The Lloyd Booth Co., Youngstown, O.
Vulcan Foundry & Machine Co., New Castle, Pa.
Mossberg & Granville Mfg. Co., Providence, R.I.
ROOFS—
Shiffler Bridge Co., Pittsburg
Riter-Conley Mfg. Co., Pittsburg, Pa.
Wm. B. Scaife & Sons, Pittsburg, Pa.
ROPE AND CORDAGE—
Waterbury Rope Co., New Yord City.
SAWS—
Peter Gerlach & Co., Cleveland, O.
SCRAP IRON—
L. K. Hirsch, Chicago, Ill.
Hyde Bros. & Co., Pittsburg, Pa.
Illinois Steel Co., Chicago, Ill.
SCREENS FOR COAL, ORE, ETC.—
Robt Aitchison Perforated Metal Co., Chicago.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
SCREWS—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill
SCREW MACHINES—
Cleveland Ball & Screw Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
SECOND-HAND MACHINERY—
L. K. Hirsch Chicago, Ill.
Hyde Bros & Co., Pittsburg, Pa.
Torbert & Peckham, Chicago, Ill
American Machinery & Trading Co., N. Y. City.
SENSITIVE DRILLS—
American Tool Works Co., Cincinnati, O.
SEPARATORS—
Harrison safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.
SHAFTING—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Bethlehem Steel Co., South Bethlehem, Pa.
American Steel & Wire Co., Chicago, Ill.
SHAPERS—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.
American Tool Works Co., Cincinnati, O.
SHEARING AND PUNCHING MACHINERY—
Bertsch & Co., Cambridge City, Ind.
Danielson Machine & Tool Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
Cleveland Punch & Shear Wks. Co., Cleveland, O.
SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.
SHEET IRON—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago Ill.
Republic Iron & Steel Co., Chicago, Ill.
Struthers Iron & Steel Co., Struthers, O.
SHIP YARDS—
Wm. Cramp & Sons, Philadelphia, Pa.
SOLID STEEL SHEAR KNIVES—
Samuel Trethewey & Co., Pittsburg, Pa.
SPIKES—
L. K. Hirsch, Chicago, Ill.
SPECIAL MACHINERY—
Cleveland Punch & Shear Wks. Co., Cleveland, O.
American Tool Works Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.
Avery Stamping Co., Cleveland, O.
Mossberg & Granville Mfg. Co., Providence, R.I.
Q & C Co., Chicago, Ill
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.
STACKS—
Wm. B. Scaife & Sons, Pittsburg, Pa.
STAND PIPES—
The Wm. B. Pollock Co., Youngstown, O.
The United Boiler Co., Girard, O.
STEAM BOILER INSPECTORS—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.
STEAM PIPE AND BOILER COVERING—
C. H. Besly & Co., Chicago Ill.
STEAM PACKING—
James B. Clow & Sons, Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
STEAM PUMPS—
Hall Steam Pump Co., Pittsburg, Pa.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
STEAM SEPARATORS—
James Bonar & Co., Pittsburg, Pa.
Austin Separator Co., Detroit, Mich.
Harrison Safety Boiler Works, Philadelphia, Pa.

STEAM SHOVELS AND DREDGES—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
STEAM SPECIALTIES—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.
STEEL—
Otis Steel Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
Braeburn Steel Co., Braeburn, Pa.
Cabeen Co., Philadelphia, Pa.
Champion Iron & Steel Co., Muskegon, Mich.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Byron H. White, Chicago, Ill.
Monongahela Iron & Steel Co., Pittsburg, Pa.
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co., Chicago, Ill.
Struthers Iron & Steel Co., Struthers, O.
STEEL BALLS—
Cleveland Ball & Screw Co., Cleveland, O.
STEEL BANDS—
American Steel Hoop Co., Pittsburg, Pa.
American Steel & Wire Co. Chicago, Ill.
STEEL BLOOMS AND BILLETS—
American Steel & Wire Co., Chicago, Ill.
Cabeen Co., Philadelphia, Pa.
Champion Iron & Steel Co., Muskegon, Mich.
National Steel Co., Chicago, Ill.
Bethlehem Steel Co. South Bethlehem, Pa.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
American Steel Hoop Co., Pittsburg, Pa.
STEEL CARS—
The Pressed Steel Car Co., Pittsburg, Pa.
STEEL CASTINGS—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.
Hercules Steel Casting Co., Harvey, Ill.
STEEL CEILINGS—
Berger Manufacturing Co., Canton, O.
STEEL FRAME MILL BUILDINGS—
Wm. B. Scaife & Sons, Pittsburg, Pa.
STEEL FOUNDRY PLANTS—
Whiting Foundry Equipment Co., Harvey, Ill
STEEL HOOPS—
American Steel Hoop Co., Pittsburg, Pa.
STEEL PLANTS—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.
TANKS—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, O
Wm. B. Scaife & Sons, Pittsburg, Pa.
The Wm. B. Pollock Co Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
The United Boiler Co., Girard, O.
TANK CARS—
The Wm. B. Pollock Co., Youngstown, O.
TESTING MACHINERY—
Keystone Driller Co., Beaver Falls, Pa.
TIN AND TERNE PLATES—
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, New York City.
TIN PLATE MACHINERY—
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
TOOL STEEL—
C. H. Besly & Co., Chicago, Ill.
Braeburn Steel Co., Braeburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Monongahela Iron & Steel Co., Pittsburg, Pa.
TRAMWAY EQUIPMENT—
Whiting Foundry Equipment Co., Harvey, Ill.
TRANSMISSION MACHINERY—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
W. A. Jones Foundry & Machine Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
TROLLEY TRACKS—
Whiting Foundry Equipment Co., Harvey, Ill.
Northern Engineering Works, Detroit, Mich.
TRUCKS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
TUBES—
National Tube Co., Pittsburg, Pa.
S. Fix' Sons, Cleveland, O.
TUBE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.
TUBE WELDING—
S. Fix Sons, Cleveland, O.
TUMBLERS—
Northern Engineering Works, Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.
TURNBUCKLES—
Republic Iron & Steel Co., Chicago, Ill.
Cleveland City Forge & Iron Co., Cleveland, O.
TWIST DRILLS—
C. H. Besly & Co., Chicago, Ill.

TWIST DRILL CASES—
Vulcan Mfg. Co., Pittsburg, Pa.
VALVES—
James B. Clow & Sons, Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.
WASHERS—
Avery Stamping Co., Cleveland, O.
WATER SOFTENING PLANTS—
Wefugo Co., Cincinnati, O.
WIRE—
American Steel & Wire Co., Chicago, Ill.
WIRE COATING—
The Ironsides Company, Columbus, O.
WIRE FENCING—
American Steel & Wire Co., Chicago, Ill.
WIRE FILLER—
The Ironsides Company, Columbus, O.
WIRE MACHINERY—
S. W. Goodyear, Waterbury, Conn.
Mossberg & Granville Mfg. Co., Providence, R.I.
WIRE NAILS—
American Steel & Wire Co., Chicago, Ill.
WIRE ROPE—
Waterbury Pope Co., New York City.
WIRE ROPE COATING—
The Ironsides Company, Columbus, O.
WIRE ROPE FILLING—
The Ironsides Company, Columbus, O.
WOOD PULLEYS—
Dodge Mfg. Co., Mishawaka, Ind.
WROUGHT PIPE—
National Tube Co., Pittsburg, Pa.

Alphabetical List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

	PAGE
Acme Malleable Iron Works	2
Ætna Fire Brick Co	37
Aitchison, Rob't, Perforated Metal Co	36
Allis & Co., Edward P	46
American Carburising Co	33
°American Machinery & Trading Co	2
American Steel Hoop Co	42
American Steel & Wire Co	41
American Tin Plate Company	43
American Tool Works Co	30
Apollo Iron & Steel Co	1
Armstrong Bros. Tool Co	1
Armstrong Mfg. Co	31
Aultman Co	2
Austin Separator Co	51
Avery Stamping Co	52
Baird Machinery Co., U	25
Baker Mfg. Co., James H	29
Baush & Harris Machine Tool Co	52
*Berger Mfg. Co	—
*Bertsch & Co	—
Besly & Co., Chas. H	52
Bethlehem Steel Co	51
*Bickford Drill & Tool Co	31
Bickford, H	52
Blair & Co., Reed P	2
Blakeslee Mfg. Co	1
Bonar & Co., James	31
Booth Co., The Lloyd	45
Bourne-Fuller Co	1-2
Braeburn Steel Co	38
Brass Founders' Supply Co	33
Bristol Co., The	1
*Brown, Edward	—
Brown Hoisting and Conveying Machine Co	35
Bucyrus Co	32
Buhl Malleable Co	22
Bultman & Co., F. H	32
Cabeen & Co	34
Cahall Sales Department	1
Central Electrotype & Engraving Co	39
Champion Iron & Steel Co	43
*Champion Rivet Co	27
Chicago Drop Forge & Foundry Co	1
Chicago Fire Clay Product Co	37
Chicago Press Clipping Bureau	35
*Chicago Rawhide Mfg. Co	39
Chicago Screw Co	1
Cincinnati Corrugating Co	1
Clayton Air Compressor Works	2
Clearfield Fire Brick Co	37
Cleveland Ball & Screw Co	31
Cleveland City Forge & Iron Co	1
Cleveland Crane & Car Co	35
†Cleveland Facing Mill Co	—
Cleveland Punch & Shear Works	29
Clinton Iron & Steel Co	31
Clow & Sons, James B	2
Cole, J. Wendell	52
Covert Mfg. Co	31
Cramp & Sons, Wm	33
Cremer & Bicknell	36
Crescent Steel Co	38
Danielson Machine & Tool Co	52
Davis Machine Co., W. P	31
Denison, Prior & Co	25
Delano, E. A	51
Dixon Jos., Crucible Co	38
*Dodge Mfg Co	27
Dover Fire Brick Co	33
Drake, Bartow & Co	34
Dyson & Sons, Joseph	51
Ellis Manufacturing Co	40
Emmerton, F. A	2
Enterprise Boiler Co	1
Erikson, Edward E	25
Excelsior Iron Works Co	26
Exeter Machine Works	35
Fitzsimons & Co	38
*Fix Sons	36
Forsythe Pattern Works	39
Fraser & Chalmers	29
Frick Coke Co., H. C	1
Furlow & Son, Thomas	37
Gandy Belting Co	52
Garden City Sand Co	37
Gerlach, Peter & Co	38
Ginther, G. H	40
Gobeille Pattern Co	39
Goodyear, S. W	31
Grasselli Chemical Co	26
Greenwald Co., I. & E	46
Hall Steam Pump Co	31
Hanna & Co., M. A	34
Harrison Safety Boiler Works	22
Hartford Steam Boiler Insp. & Ins. Co	39
Hendrick Mfg. Co., The	36
Hercules Steel Casting Co	24
Heyl & Patterson	33
†Hickman, Williams & Co	—
Hiertz & Son, Theo	2
Hillman & Son, J. H	1
Hirsch, L. K	2
Holmes, Strachan & Co	37
Hooven, Owens & Rentschler Co	32
Hunt Robt. W. & Co	2
Hyde Bros. & Co	44
Illinois Central R. R	42
Illinois Steel Co	40
Ingersoll-Sergeant Drill Co	2
Iron Clad Paint Co	45
Ironsides Co	24
Jeffrey Mfg. Co	35
Jenkins Bros	38
Jones & Co., John T	2
Jones Foundry & Machine Co., W. A	1
Jones & Laughlins, Ltd	42
Kennedy, Julian	36
Kennedy, Walter	37
Kentucky Fire Brick Works	25
Keystone Driller Co	40
Konigslow & Bro., H	31
La Belle Steel Co	38
Lake Superior Consolidated Iron Mines	34
Laughlin & Co., Alex	36
Lidgerwood Mfg Co	35
Link-Belt Machinery Co	35
Lorain Foundry Co	45
Lorain Steel Co	43
Macbeth & Co	25
°Magnolia Metal Co	—
Mason, Samuel R	31
Main Belting Co	36
Manning, Maxwell & Moore	29
Marion Steam Shovel Co	52
McKeefrey & Co	34
Meehan Boiler & Construction Co	52
Monongahela Iron & Steel Co	38
Morris & Bailey Steel Co	38
Mossberg & Granville Mfg Co	30
National Engraving Co	33
National Steel Co	40
National Steel Co., Aetna-Standard works	34
National Tube Co	40
†Newport Sand Bank Co	—
Northampton Emery Wheel Co	26
Northern Engineering Co	35
Nuttall Co. The R. D	31
Oak Hill Fire Brick & Coal Co	25
Oglebay, Norton & Co	34
†Ohio Sand Co	—
Otis Steel Co	24
†Parkhurst & Wilkinson Co	—
Perfect Lubricating Metal Co	52
Phœnix Horse Shoe Co	25
Pickands, Brown & Co	34
Pickands, Mather & Co	34
Pollock, The Wm. B. Co	2
Prescott Steam Pump Co	31
Pressed Steel Car Co., The	39
*Pullman, J. Wesley	31
Q & C Co	23
Rand Drill Co	2
Republic Iron & Steel Co	1-43
Riter-Conley Mfg. Co	36
Riverside Foundry Co	24
Rogers, Brown & Co	1-23
*Rockwell & Co., W. S	1—
Ryan, J. J. & Co	39
Scaife & Sons, Wm. B	51
Schaefer & Co., W. J	52
Schuylkill Iron & Steel Co	51
Scioto Star Fire Brick Works	37
Seaman, Sleeth Co	45
Sennett Co., Geo. B	46
‖Sharon Fire Brick Works	1
Shiffler Bridge Co	36
Smith & Co. A. P	35
Southwark Foundry and Machine Co	46
Spearman Iron Co	52
Star Corundum Wheel Co	37
Stevens, F. B	29-48
Stroud & Co., R. H	2
Struthers Iron & Steel Co	1-34
*Superior Charcoal Iron Co	27
Swartz Metal Refining Co	1
Tabor Mfg Co	37
Taylor's Sons Co., Chas	25
Textor, O	2
Tod, Stambaugh & Co	34
Tod, Wm. & Co	46
Torbert & Peckham	44
Totten & Hogg Iron & Steel Foundry Co	45
Trethewey & Co., Ltd., Samuel	39
Union Mining Co	24
Union Boiler Tube Cleaner Co	1
United Boiler Co	36
Upson Nut Co	1
Van Dorn & Dutton Co	33
Vermillion Pine & Iron Land Co	32
Vulcan Foundry & Machine Co	37
Vulcan Mfg. Co	36
Waterbury Rope Co	29
Webster, Camp & Lane Machine Co	25
Webster Fire Brick Co	1
Wellman-Seaver Engineering Co	36
†Wefugo Co	—
Wheeling Mold & Foundry Co	52
White, Byron H	38
Whiting Foundry Equipment Co	35
Wyman & Gordon	51

IRON AND STEEL MARKETS.

IRON ORE.

(On Lake Erie Docks.)

Special low-phosphorus hard ore, Bessemer	$6.50
No. 1 Specular, Bessemer	$5.75@ 6.00
No. 1 Bessemer, hematite	5.25@ 5.75
Hematites No. 1 non-Bessemer	4.00@ 4.50
No. 1 Specular, non-Bessemer	4.50@ 4.75
Mesabi Bessemer	4.50@ 4.85

PIG IRON.

Cleveland (f. o. b. cars):

Bessemer	$24.90
No 1 Strong Foundry	$23.00@ 23.50
No. 2 Strong Foundry	22.50@ 23.00
Gray Forge, red short	21.25@ 21.75
No. 1 American Scotch	23.00@ 23.50
No. 2 American Scotch	22.50@ 23.00
Lake Superior Charcoal	25.00@ 26.00

OLD RAILS AND SCRAP METAL.

(Delivered Cleveland.)	GROSS TONS
Old iron rails	$26.00
Old steel rails (6 ft. and over)	21.00
Old steel rails (6 ft. and under)	22.00
Old car wheels	22.00
	NET TONS.
No. 1 R. R. wrought scrap	$25.00
Mill scrap	17.00
No. 1 Machine cast scrap	17.00
Iron axles	28.00
Axle turnings	16.00
Wrought turnings (free from cast)	13.00
Cast borings	11.00
Uncut wrought iron boilers	10.00
Steel boiler plates	16.00
Grate bars	11.00
Pipes and flues (clean)	15.00
Tank Iron	16.00
Hoop and band iron	12.00
Sheet iron	10.00
Wrought drillings	13.00
Malleable iron	15.00

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)	2.35c
Angles	2.35@ 2.45c
Tees	2.45c
Universal plates	2.60c
Sheared plates	2.70c

Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is now noticeable in every section of the country, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity

IT ISN'T A MERE QUESTION OF ECONOMY IN FUEL,

Though we claim to save good money you are now burning up—but the infinitely better service you get with every pound of steam from which the moisture has been eliminated by an

AUSTIN SEPARATOR.

There's many a business man who struggles along with a $5.00 a week office boy when he might employ a good man with much better effect.

So with steam plants. It's the up-to-date equipment that produces most for the least money and the initial cost don't count.

We ship to responsible parties anywhere in the United States on 30 days' trial, and pay freight both ways if our guarantee of satisfactory service is not substantiated.

AUSTIN SEPARATOR CO.,

18-23 Woodbridge St.,

DETROIT, - - MICH.

"It is true that advertising will not put merit into poor merchandise, but good merchandise often becomes poor for the want of good advertising."

—*Some Essential Oils for Advertisers*

The evolution of the engine-shaft, from the rough-hewn log to the modern forging of

HIGH GRADE STEEL,

is an interesting study in mechanics.

SEND TO OUR NEAREST OFFICE FOR PAMPHLET.

BETHLEHEM STEEL COMPANY,

SOUTH BETHLEHEM, PA.

BRANCH OFFICES:—100 Broadway, New York. 421 Chestnut Street, Philadelphia. 1433 Marquette Building, Chicago. 406-407 Perry-Payne Bul'ding, Cleveland. 340-342 Main Street, Cincinnati. 601 Burlington Building, St. Louis. 430 Endicott Building, St. Paul. 726 Gravier Street, New Orleans.

Fine Grade Steel Forgings.

FORGINGS

Heavy and Light.

WYMAN & GORDON

Worcester, Mass.

FORGINGS.

LAID STEEL FORGINGS FOR STAMPING DIES.

SHAFTS, SPINDLES AND MACHINERY FORGINGS OF ALL KINDS.

Prompt Shipment. JOS. DYSON & SON, Kirtland St., CLEVELAND, OHIO.

WE MANUFACTURE AND ERECT

STEEL FRAME MILL BUILDINGS

in all parts of the United States.

IRON and STEEL TANKS for Liquids or Gases.

GERM PROOF WATER FILTERS, 10 gal. to 10,000 gal. capacity per hour.

RIVETED STEEL PIPE.

STEEL STACKS.

Wm. B. Scaife & Sons,

(Established 1802.)

PITTSBURGH, - - - PA.

E. A. DELANO,

50 to 52 So. Clinton St., Chicago.

MANUFACTURER OF

SHAFTING, PULLEYS & HANGERS.

A Large Stock Constantly on Hand.

CORRESPONDENCE SOLICITED.

SCHUYLKILL IRON AND STEEL CO.,

Works, Grays Ferry Road, 28th to 30th St., PHILADELPHIA, PA.

MACHINERY CASTINGS OF ALL SIZES AND KINDS
DRY SAND AND LOAM CORLISS CYLINDERS A SPECIALTY
BUILDERS' CASTINGS AND GENERAL FOUNDRY WORK

STRUCTURAL and ORNAMENTAL IRON WORK.

Advertisers who "keep everlastingly at it" win success. That is the testimony of the shrewdest and livest of them.

PIG IRON

Spearman Iron Company,

Sharpsville, Pa.

Inspected Foundry Irons. Softness, Strength, Fluidity, Uniformity.

American Scotch

brand unequaled.

HENDERSON & TRAGO, Agents, CLEVELAND, O.

Absolutely without a rival.

Perfect Lubricating Metal.

The only Phosphorized Tin Graphite Bearing Metal in the world. Write for particulars. Ask your dealers for it.

Perfect Lubricating Metal Co.,

Second and Plum Sts.,

Cincinnati, Ohio, U. S. A.

THE **DANIELSON MACHINE AND TOOL COMPANY,**

DEALERS IN

MACHINERY and Machine Tools

MANUFACTURERS OF

DIES,

Special Machinery, Etc.

Special Department for **DEVELOPING INVENTIONS** in SECRET.

A full line of **NEW and SECOND HAND PRESSES and MACHINE TOOLS** carried in stock

93 to 97 Lake St., Cleveland, O.

DETROIT

Emery-Corundum WHEELS,

Sellers' Tool and Twist Drill Grinders.

J. WENDELL COLE,

P. O. Box 84, COLUMBUS, OHIO.

911 No. 112 Clark St., CHICAGO, ILL.

Radial Drills,

FOR EVERY CLASS OF WORK. 1899 Catalog Describes Them.

BAUSH & HARRIS MACHINE TOOL CO.,

Springfield, Mass., U. S. A.

SALES AGENTS:
MANNING, MAXWELL & MOORE, New York, Chicago, Pittsburg, and Cleveland.
HILL, CLARK & CO., Boston.

EUROPEAN AGENTS:
SELIG SONNENTHAL & CO., London, E. C.
E. SONNENTHAL, Jr., Berlin, Germany.

MEEHAN VERTICAL WATER TUBE BOILER.

The Best Boiler for Utilizing Waste Gases Around Blast Furnaces and Rolling Mills.

We Make a Specialty of Repair and Renewal Work at Plants.

THE MEEHAN BOILER & CONSTUCTION CO.,

Lowellville, Ohio.

The "ORIGINAL GANDY"

Stitched Cotton Duck Belting,

Especially adapted for Main Drivers, Saw Mills, Cotton Gins, Cotton Presses, and for all places where belts are subjected to moisture or atmospheric changes, the "GANDY" stands paramount.

For further information, prices, etc., write

The GANDY BELTING CO., Baltimore, Md.

Steam Shovels

FOR

Iron Mining.

We have machines of new designs with hoisting, swinging and crane engines. These were designed and constructed especially to meet requirements of iron mining and coal mining fields.

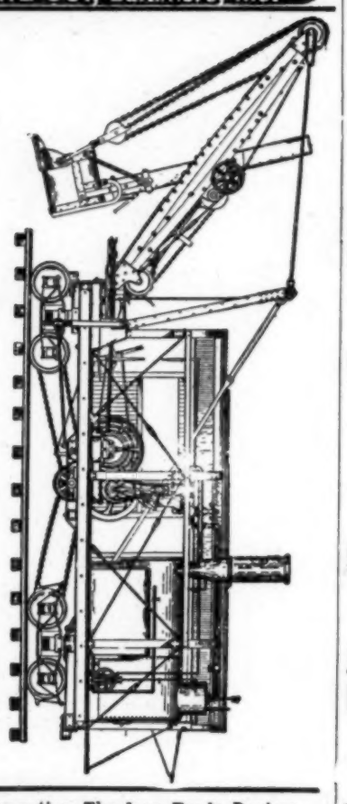
WE INVITE MOST RIGID INVESTIGATION.

For full information address

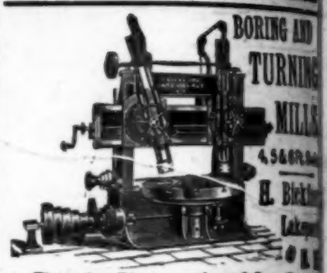
THE

MARION STEAM SHOVEL CO.

Marion, Ohio.



When writing to advertisers please mention The Iron Trade Review.



BORING AND TURNING MILLS

Write for Photograph and Low Prices.

Fire Brick, Fire Clay, Pig Iron

F. B. STEVENS, Detroit, Mich.

When writing to advertisers please mention The Iron Trade Review.

VERMILION PINE & IRON LAND CO.

13,000 Acres of Mineral Land.

Situated on the Mesabi and Vermilion Iron ranges in Minnesota.

FOR SALE OR LEASE.

on favorable terms. Correspondence solicited.

Address R. P. BRONSON, Ishpeming, Mich.

Advertisements that are stereotyped, that are to the point and that are frequently changed bring best results.

ECLIPSE

Pneumatic Hammers and Drills

Most Efficient and durable. Prices Right.

W. J. SCHAEFER & CO.,

33 Barclay St., New York City.

Send for Catalogue.

IRON CASTINGS

Special Machinery

WHEELING MOLD AND FOUNDRY CO.,

WHEELING, W. VA.

Pittsburg Office, 717 Park Building.

Pressed Metal Work

Light and Heavy Plates Cut to Shape. Washers and Felloe Plates.

Sole Mfrs. of "NEVER-BREAK" Gauge.

THE AVERY STAMPING CO., Cleveland.